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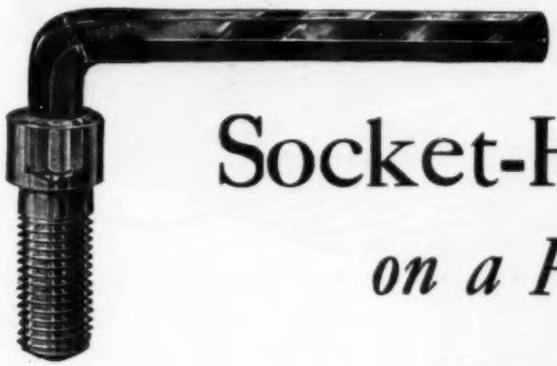


Making Socket-Head Capscrews *on a Production Basis*

By M. H. Flynn
Factory Manager, Allen Manufacturing Company

SOCKET-HEAD capscrews have been finding a wide field of application in replacing the ordinary types of hexagon-head and slotted-head screws. Socket heads were first used on setscrews, gaining their early popularity as "safety" screws. But certain other advantages beside the safety feature were evident that could also be applied to the capscrew, such as the ease of working in a blind position or close to a shoulder. Moreover, on such applications of the capscrew as the holding down of punch-press dies to the block, it is extremely difficult to assure a tight screw using a screw driver with the ordinary slotted-head screw, while the socket-head capscrew can be tightened firmly into place. This type of capscrew has, therefore, gained a distinct place in the field, although it is apparently not as generally known as it should be. An example of the use is shown in Fig. 1 where capscrews are employed to hold the punches to the block. In the illustrations, showing the operations, many socket-head setscrews and capscrews may be seen in the toolholders and machines. The ability to use a wrench in the socket heads naturally permits greater leverage than is possible with a screw driver, and rigidity of the parts without fear of loosening is assured.

The production of socket-head capscrews as a departure from the standard line of capscrews called for an entirely new set-up of operations, and the added stresses due to the application of the hexagonal wrench of large leverage also brought about a need for improvement in material and in heat-treatment.

Capscrews of this type are now made regularly in sizes from $\frac{3}{16}$ in. in diameter, $\frac{1}{2}$ in. long, up to 1 in. in diameter and 6 in. long. Cold-drawn nickel-chromium steel, having a tensile strength of over 150,000 lb. per sq.in. after heat-treatment, is used. The first operation consists in turning, threading, and cutting-off on multiple-spindle automatics. The machine set-up for a large size is shown in Fig. 2. The production varies with the size of screw, it being about 180 per hour for the $\frac{3}{8}$x1-in. size.

From the automatics the screws go, together with the chips, to the oil separators, and then directly into the chip separators, which are standard machines. After being separated from the oil and from the chips the

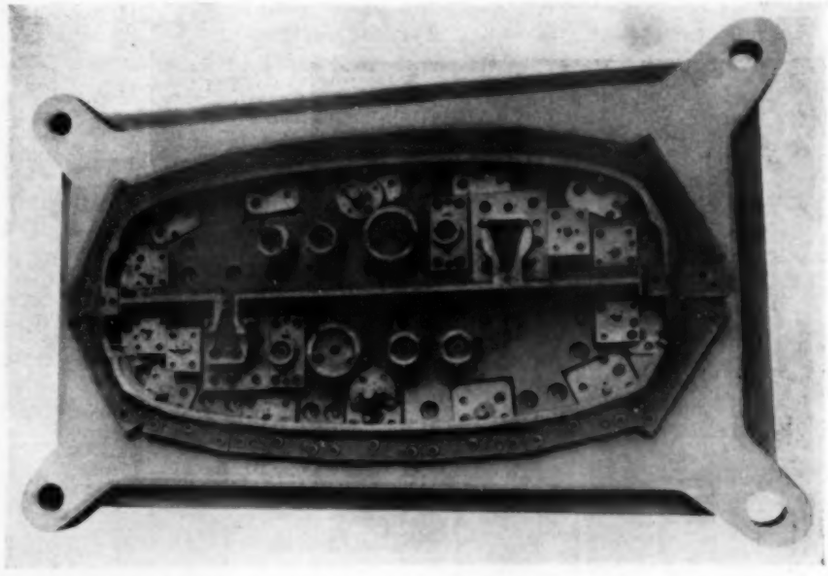
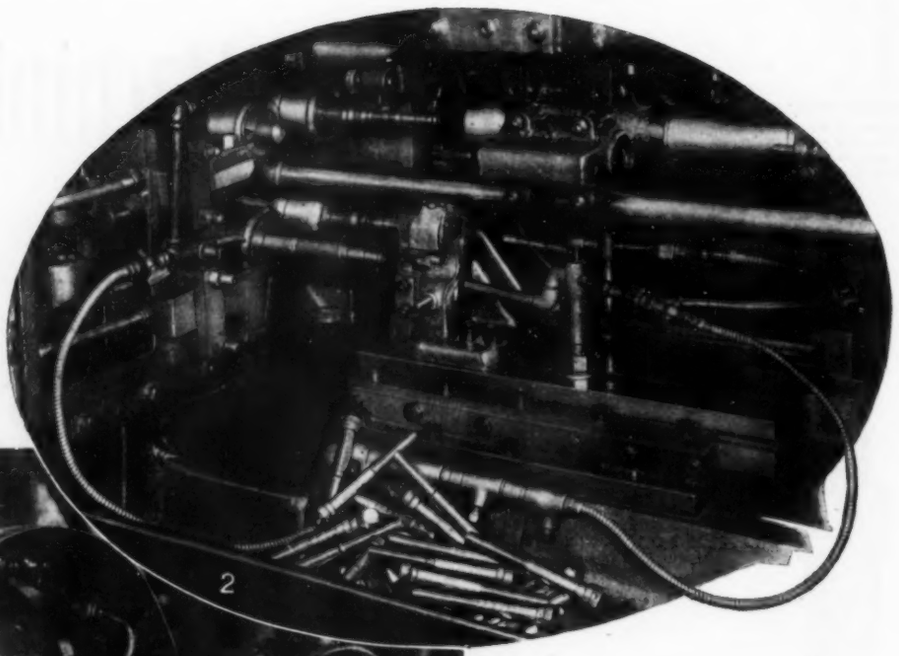


Fig. 1—Example of the use of socket-head capscrews. It would be impossible to use hexagon head capscrews, and fillister head slotted screws would not hold well

Fig. 2—Set up of multiple spindle automatic for large sized capscrews. The maximum standard size is 1 in. dia. by 6 in. long, while the smallest is $\frac{5}{16}$ x $\frac{1}{2}$ inch

Fig. 3—The hole in the head must be drilled central, so as to register properly on the drawing operation. This is accomplished by rotating the part to be drilled in an automatic screw machine. The pieces are fed to it by hand



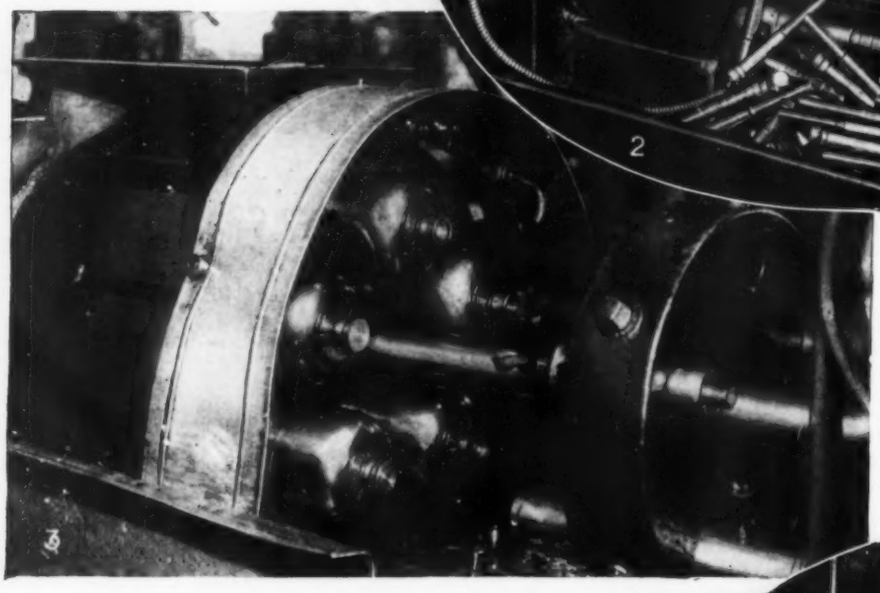


Fig. 5 — Drawing the hexagonal wrench hole in a single die. The use of this type of press and die is fixed by the size of the head being drawn

Fig. 4 — Using a dial feed press for drawing the hexagonal wrench hole. The left hand figure under the illustration shows a "blank" setcrew ready for drawing. Its shape has been carefully figured out for registration, drawing and finishing purposes

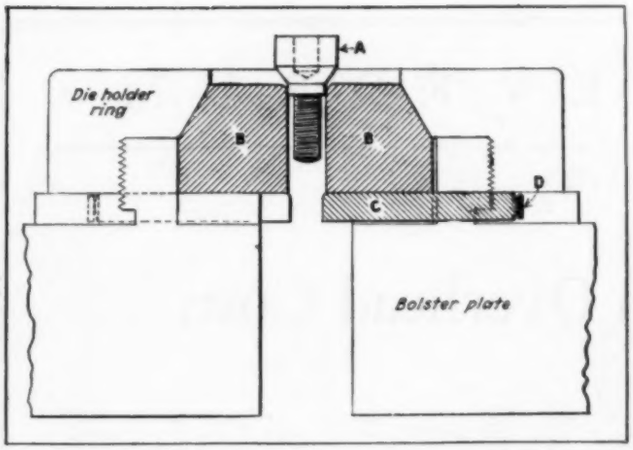


Fig. 6—Cross-section of a single die showing the method of stripping. The dies are very simple and are held in place by a keeper ring

screws are given a thorough alkaline wash before returning to the machine room. It will be noted that no separation of screws and chips is done at the machine, the operator sending along both chips and screws in the same container. The order tag always accompanies the container, and it is written in indelible ink on a heavy grade of linen paper so that it will not become illegible after contact with oil or wash water. The tag actually passes through the washing machine with the work.

The second machining is the drilling of the heads, which is done on a 5-spindle automatic machine, Fig. 3, the screws being fed to it by hand. The hole in the head is drilled to the diameter of the distance across corners of the hexagon to allow entry of the punch in the next operation. After being drilled the work goes to the oil and chip separators, and is also washed. For forming the hexagon socket two methods are employed; for small sizes and for short capscrews the dial feed press shown in Fig. 4 is used, while those too large or too long for the dial, are drawn in a single die as Fig. 5 shows.

A cross-section of the single die is illustrated in Fig. 6. The capscrew head as shown at *A* has three diameters; the lower one is practically the finished size and is used for locating the screw in the drawing die, and the bevel starts the draw gradually when the head is pushed through the die *B* by the hexagon-shaped punch, and the metal is forced in and around the punch. The amount of metal in the head is calculated so as to be just sufficient to draw to the proper size plus the small amount left for finishing. The hexagonal hole made in this drawing operation is the same size as the punch used. The metal of the head is forced so tightly around the punch that it has to be stripped off by the stripper *C* actuated by the spring *D*. The material for the wrench used in these holes is cold-drawn hexagonal rod, drawn within the limit of plus or minus .001 in. with sharp corners. This provides a good fit between screw and wrench enabling the user to apply extra leverage by means of a pipe, or otherwise, to the wrench, without spoiling the corners of the wrench, or distorting the screw head. The wrenches are L shaped, made of the same type of alloy steel as the screws, and heat-treated.

The final machining operation consists in finish turning the head after forming. This is done on an automatic screw machine as shown in Fig. 7. The screw is located by the hexagon hole on a finger in the turret, and is fed automatically into the spring chuck. It is held by the thread so as to insure concentricity of thread and head. For high production of the smaller sizes of screws a magazine feed is used on the machine.

All screws are heat-treated by heating to a uniform temperature of 1,560 to 1,600 deg. F., and quenching in oil. About 500 lb. of screws is charged in each furnace at one time. A tilting-type of furnace is used, and the

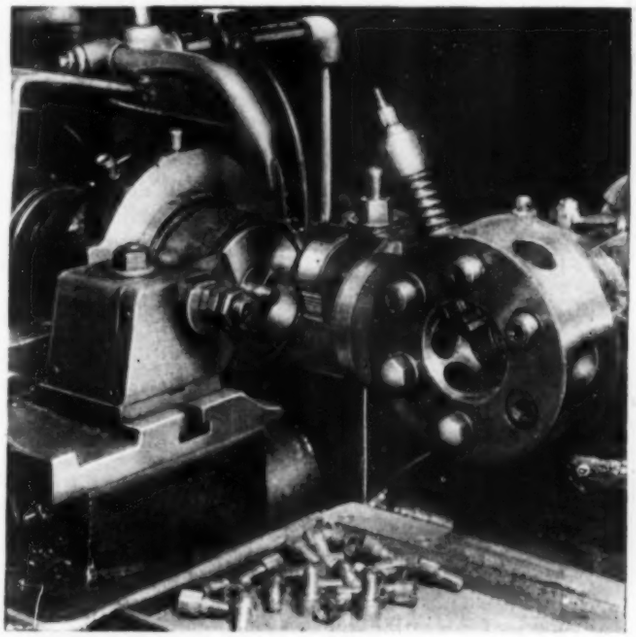


Fig. 7—The heads are finished all over, concentric with the thread. The work is done in a B & S automatic, the operator placing the screw on the finger in the turret which feeds it automatically into the chuck

charge is dumped directly into perforated carriers in the quenching tanks set in the floor. The quenching oil is kept at a nearly uniform temperature by a circulating system. The heat-treatment employed is to produce the greatest strength for the type of steel used, a strong, tough, screw being more desirable than a hard one. The heat-treatment increases the strength of these screws about 100 per cent.

Throughout the machining operations a close inspection is maintained, and a final inspection is made for thread, socket, toolmarks, burrs, and concentricity. All threads are required to pass inspection for lead as well as for pitch diameter. Every screw is fully inspected.

Tolerance Standardization

The research engineer of the Skoda Works at Pilsen will continue the discussion in the *American Machinist* of March 7 on the relative merits of the German DIN and the Skoda tolerance systems. It shows that there is apparently still room for improvement all around. In early numbers some American authorities will compare these European systems with American standards, which are also not considered final.

Getting Details on Overhead Costs

"WE'RE discussing overhead again, Bill," said R. J. Hartwell of the machine company that bears his name. "Harper here says we do too much lumping of expenses and miss a lot of details that we ought to know. Sit in with us, Bill, and show him where he's wrong." And he motioned to a seat at the lunch table.

"From what you say, R. J., I'd guess Harper wasn't so far wrong. But let's have some of the details before we go any further," replied Holland.

"I've been telling them," said Harper, "that we didn't get enough details in many cases to know whether an item of overhead was high or low. I was thinking especially about belting—and it's a big item in most shops."

"But how are you going to save money by knowing which machine uses up the most belts, Harper? You've got to get new ones anyhow and why spend a lot of time fussing about details?"

"That's a bad start, R. J. It's so you won't have to buy 'new ones anyhow' that you need more facts. We had one department that used up a lot of belts. So I put a bright young man in there to watch things. He found that most of the belts were being used up on two machines. We had loaded them to the limit and the belts were too narrow for the work."

"That was the fault of the builder, wasn't it, Harper?"

"Yes, Hartwell, perhaps it was. But we paid for the belts. So we put on wider pulleys, and saved quite a wad of money on belts."

"Belting is a real problem," spoke up Holland, "even in these days of motor drives. And I know several concerns who are saving money by following Harper's plan. One plant has a transmission expert come in once a month to look over the plant. He has taken off wide belts where narrow ones would do the work, put on larger pulleys and wider belts where they were needed, and saved them money."

"Why the expert, Bill?" asked R. J. "Can't one of their own men do it just as well?"

"Probably not, R. J., for two reasons. The expert *thinks* belting and transmission all the time and sees various examples in other plants. Your own man is sure to be loaded with other details that take his mind away from belts. But this expert helps the shop keep track of belt costs. He fixed up a scheduled form so that all belting was charged against the machines using it. All belt repairs were also charged to the individual machine and the idle time that came from the shut-down was noted.

"These facts show which machines need looking after. Sometimes it's the way the machines are used, and this gives the foreman a tip to watch certain operators. Sometimes the belt conditions are such that no change can be made except to substitute a motor with either direct or chain drive. But at least they know what conditions need attention."

"But don't all this cost a lot of money, Bill?" asked Hartwell.

"Of course it costs money, R. J. Quite a lot of money in the total of dollars spent in a year. But the people who have tried collecting such facts say that the plan saves a lot more than it costs. Even if it didn't save a cent they say that it would probably pay to have a report once in a while as a check on costs, and that its worth real money to know whether you are wasting money.

"As Harper says, we are too apt to lump a lot of costs under one heading and call it overhead. It pays to separate some of these costs into items that mean something tangible, so we can stop the losses."

"If you think we can really save more money than we spend on experts and keeping cost sheets, Bill, I suppose it may be worth trying."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

EXECUTIVE FORUM

Discussion

The Man Over Fifty

To my mind it is essentially foolish to generalize on the question of the productive value of men of any particular age. I was born in the year 1860, and am, therefore, 68 years old. I was apprenticed in 1874—and moreover was the son of my employer.

Let us leave the age out of the question, and look only at the ability. Let it be remembered that it is not by the exertion of brute strength that work can be done economically, but rather by bringing into use all that a man has learned during a long experience in the shops and by study, so that without turning a hair, he can put his earnings for the employer on the credit-side, while his contemporary youngster is just wearing his clothes out, and spoiling his employers material. So my contention is that if a healthy man is of no more value at 68 than he was at 40 he has been guilty of an awful waste of time.

—T. J. SONTOW, *England,*

Discontinuing Old Models of Machines

In the case cited, the best course to follow would be to educate the customer, through the aid of well written letters and advertisements, to the greater value of the new model as compared to the old. Then, after attempting to educate them, they should be notified that certain old models will be discontinued after a given period of time, but that parts will be kept for a further specified lengths of time.

The manufacturer cannot afford to go on building obsolete machines forever, even if some of his customers do like them. The way to handle this problem is through a system of education that will convince the buyer of the folly of using an obsolete type of machine. Customers can also be notified that machines of the old type will only be supplied as special after a given date. The elimination of old models by listing them as special and charging extra might accomplish the desired result because it hits the pocket-book, a vital factor in the make-up of any buyer.

The question of when and how to discontinue old models of machines can be answered by the prudent application of any of the suggestions outlined.

—S. KUPPER.

Paying for Advice

The architect and the machine builder are not in the same position when it comes to giving advice. The architect and the consulting engineer make their livings by giving advice, while the building contractor and machine builder make theirs by furnishing labor and material. The advertising pages of engineering periodicals contain many offers of free advice on all sorts of problems. Machine tool makers offer to send a representative to talk over your problems with you and to give you advice based on years of experience, hoping, as a result, to get an order from you. Some industries have set up information bureaus which give information and advice as to the uses to which their product may be put. The cost of running such a bureau has in most cases been repaid many times. The giving of information should be regarded by engineers as a means of increasing sales.

If a machine builder gives advice to an architect on cars or pumps he is presumably giving advice on a subject outside the bounds of his own business interests to a man who is never likely to be a customer. He would be justified in asking in return for free advice on, say, landscape gardening or Greek architecture, but not on buiding a factory.

To draw the line between advice which is in the nature of an advertisement and advice which is of the nature of a product of the factory, and as such should be charged for, is rather difficult.

—H. JAMES.

Preventing Unfair Rejections

It may have been O.K. for Parker to assume that the ridiculous tolerances put on the drawings by the concern for whom he was manufacturing the gears, was merely to have a tolerance to shoot at, but when he told Brown and Wilson to forget it, as the motor people were a reasonable concern, he broke his contract, and the motor company had a perfect right to reject the parts. Any concern who lets a contract, does so with the understanding that the second party will live up to the specifications and drawings of the first party or pay the penalty.

In dimensioning its gears with a tolerance, the motor company may have contemplated some slight change at some future time in their assembly of the motor, and if the gears had come to them manufactured strictly in accordance with their drawing, the gears would not have been noisy. In making a change, the motor company would do so assuming that the gears were manufactured within the tolerance. If, in checking up to find the cause of the noise, they find that the tolerance they had specified on their drawing was not adhered to, they have a right to reject them.

—MORTON SCHWAM.

Keeping Prod on the

Photographs by courtesy of the National Acme Company

Fig. 1—Upon completion in the automatics and after separation from the turnings, the finished screw products at the plant of the National Acme Company are placed in perforated steel boxes and conveyed through washing machines. An oiling operation follows the cleaning, then final inspection and delivery to finished storage

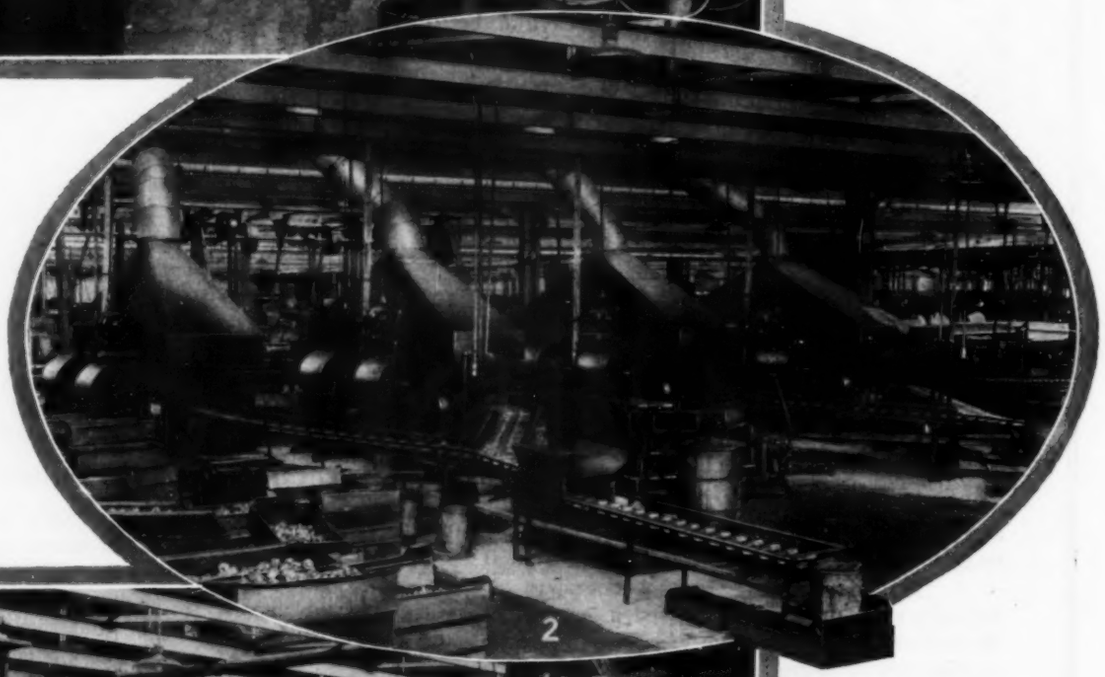


Fig. 2—The washing machines are covered with hoods to prevent any steam or odors from reaching the workers. A slight downward grade on the roller conveyors eliminates any need for manual effort in the cleaning operation

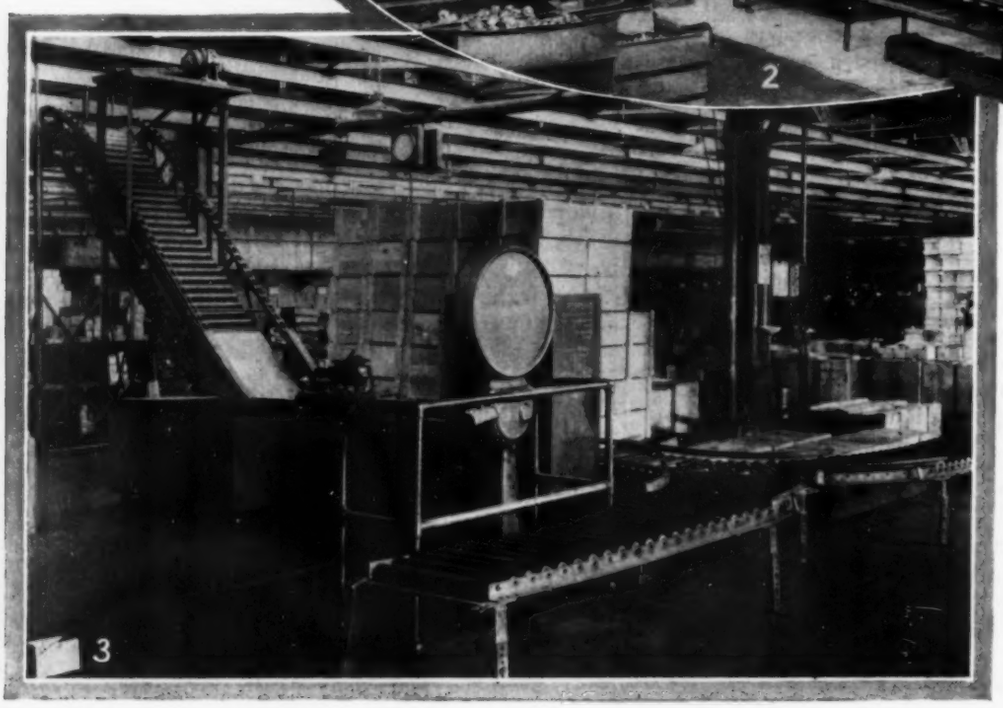


Fig. 3—The products to be shipped in car lots are weighed and placed on a conveyor. Here they move by gravity to an elevating section which takes them upward for the beginning of their journey to the shipping platform

Screw ucts Move

Fig. 4—Gravity is the major means of propulsion, but on account of the length of the conveyor, elevating, power-driven sections are installed at given points to regain height. Combinations of gravity and power sections, like this shown, work very well together to eliminate the need for long power-driven conveyors

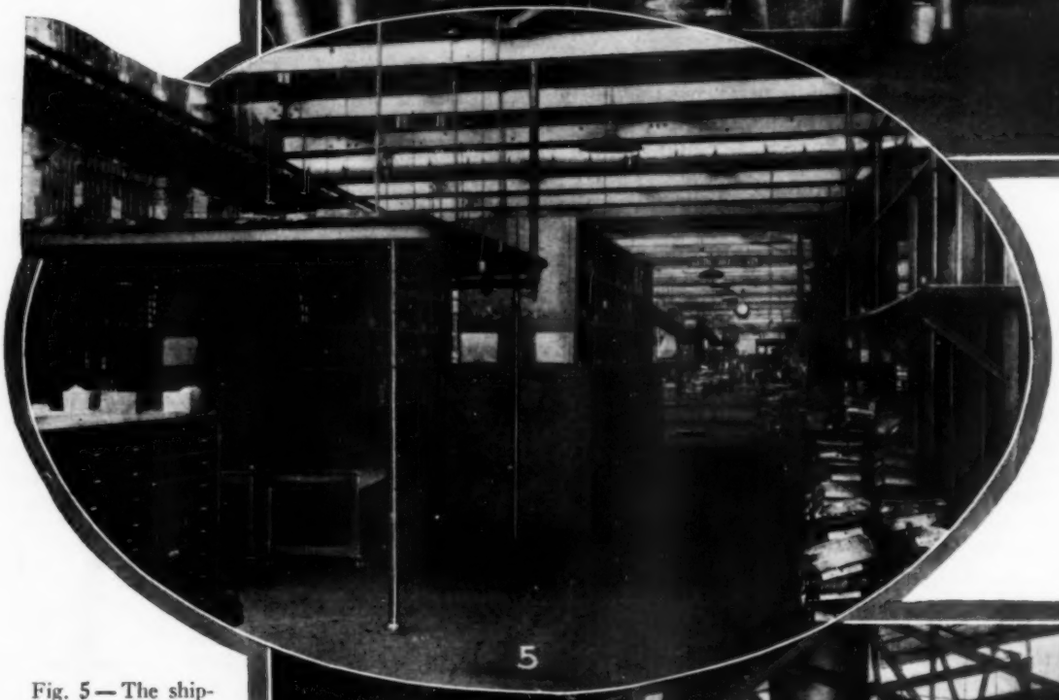


Fig. 5—The shipping - department, loading - platform conveyor is suspended up in the clear and extends across the entire width of the plant to the point where car lot shipments are loaded

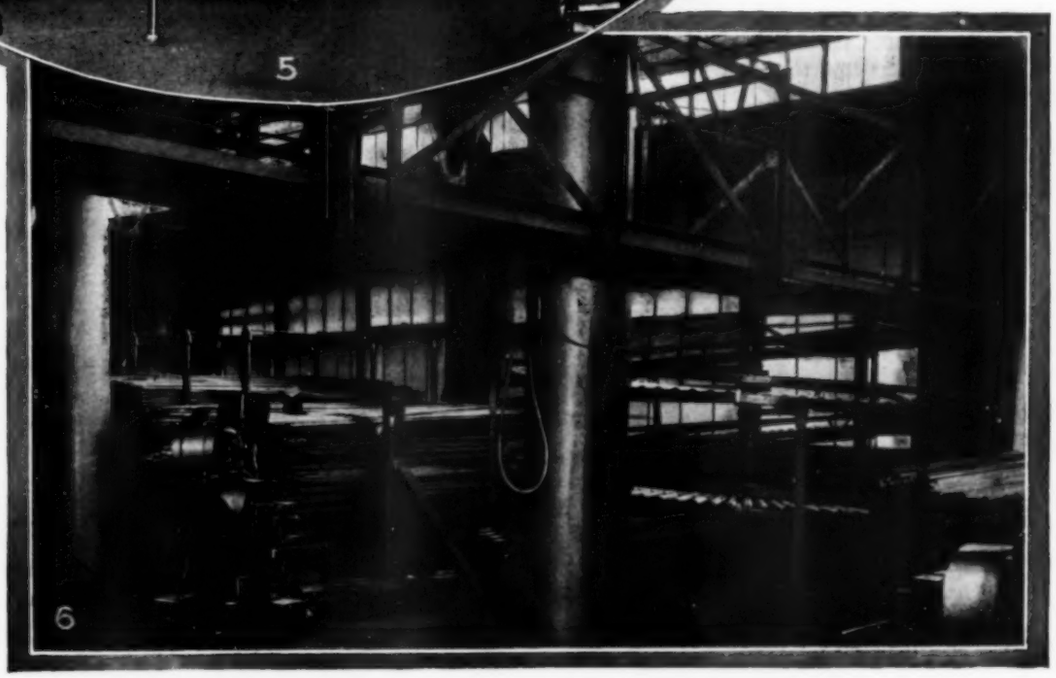


Fig. 6—After leaving the automatic department, the conveyor enters the barstock room. Here it leads into a spiral section that brings the cases of products down to the level of the shipping platform, just beyond this room

Argentina . . .

Common Economic Interests with the United States

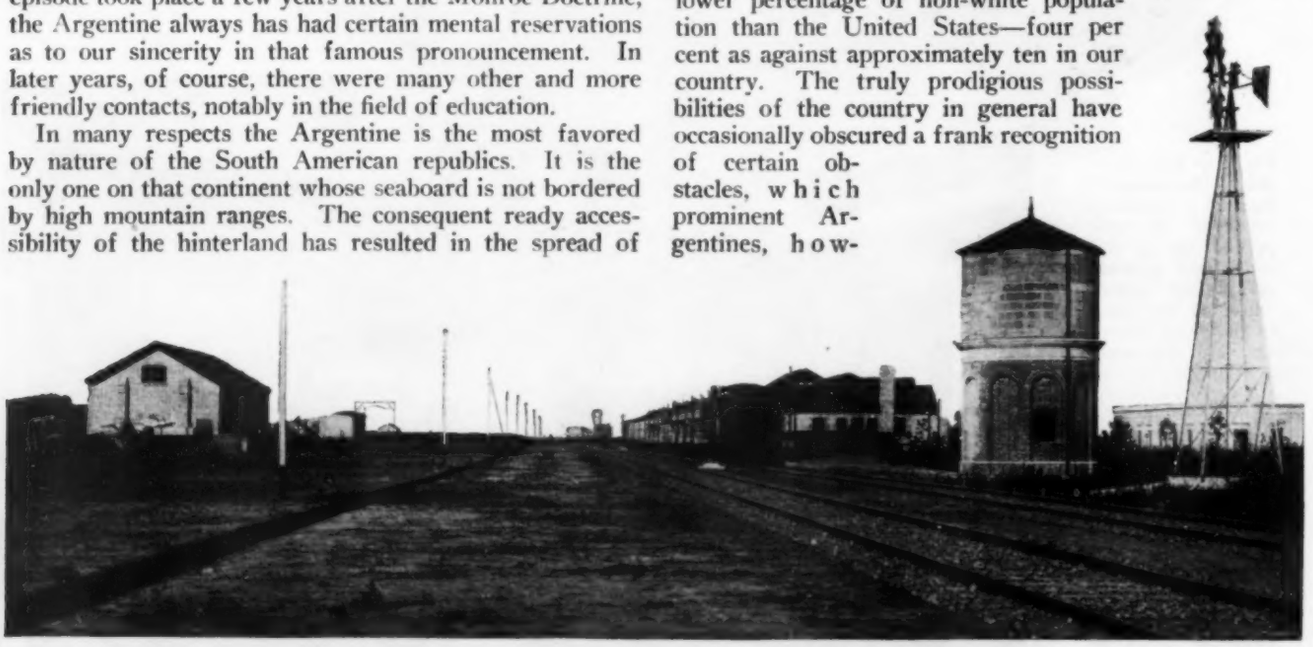
By Dr. Julius Klein

Director, Bureau of Foreign & Domestic Commerce

In this final article on foreign conditions as affecting American manufacturers the author shows how American experience in developing the industrial West can aid this new country

PERHAPS the first shipment of manufactured exports from the United States to Latin America was a cargo sent from New England to Buenos Aires in 1801. Periodically thereafter New England whalers on their way to the great fishing grounds of the South, and the clipper ships en-route to and from California during and after the gold rush, made regular calls at Argentine ports with cargoes of fabricated wares. Unfortunately, these relationships involved one episode of less favorable character when President Jackson ordered an American frigate to transfer Argentine settlers from the Falkland Islands to the mainland because they were interfering with the operations of American whalers. This action laid the way open for subsequent British settlement of the islands, but the latter still figure on Argentine maps as the "Islas Malvinas," under the colors of the southern republic instead of those of Great Britain. Since this episode took place a few years after the Monroe Doctrine, the Argentine always has had certain mental reservations as to our sincerity in that famous pronouncement. In later years, of course, there were many other and more friendly contacts, notably in the field of education.

In many respects the Argentine is the most favored by nature of the South American republics. It is the only one on that continent whose seaboard is not bordered by high mountain ranges. The consequent ready accessibility of the hinterland has resulted in the spread of the largest network of railways on the southern continent. The land is favored with a temperate climate, and an unusually rich soil quite free from stones and impregnated with volcanic dust having valuable elements for plant life. In this respect it is strikingly like the terrain of the Yangtse River valley in China, which has been tilled for 4,000 years without exhaustion and has been supporting one of the densest populations of the world. These elements of fertility and accessability account in part for the fact that although the country has but a seventh of the area and population of the whole continent, she supplies over 46 per cent of South America's trade, exports and imports. Incidentally, the population of the country is almost entirely Caucasian, as contrasted with the situation in most of the rest of Latin America, where indigenous races and descendents from African slaves are still very much in evidence. In fact, it has a lower percentage of non-white population than the United States—four per cent as against approximately ten in our country. The truly prodigious possibilities of the country in general have occasionally obscured a frank recognition of certain obstacles, which prominent Argentines, how-



Typical scene on the Argentine pampas. These plains are covered by a network of straight rail lines, but the lack of wood, stone, and coal makes industrial development difficult. The increasing development of this vast prairie region is making markets for American mill, road-building, agricultural and other machinery

ever, have frankly appreciated and endeavored to overcome. First of all, this factor of the flat terrain, so inviting for ready cultivation and the construction of railways, has one defect, namely, the difficulty of adequate drainage. Any prolonged rainfall is likely to put large sections of the country under water. This fact, plus the lack of stones, has made highway construction a problem. The remoteness of the mountain ranges also makes the exploitation of water power more difficult and costly than in the case of other Latin American countries. Coupled with this is the lack of coal, though there are compensations in the presence of petroleum on the southern shore near Comodoro Rivadavia and inland at Neuquen. These fuel resources are of such prime importance in relieving the burden of heavy coal imports, which play so large a part in the trade balance of the country, that the government has an aggressive nationalization policy with reference to oil. A further problem of major significance is the paramount one of what might be called a better balanced economic order. The present administration and its immediate predecessors have been making most strenuous efforts to break up the great estates and bring into being a large group of moderately sized farm holdings. Though some headway has been made, this problem is still far from solution. The agricultural lands are still worked very largely by migratory labor which moves with the seasons to and from Spain and Italy. The lack of manufacturing industries presents a grave difficulty in the shortage of jobs for this class of labor during the intervals between harvest periods. The government is endeavoring to alleviate this situation by facilitating permanent immigration and the acquisition of small farms, by the adjustment of taxation so as to induce the splitting up of great estates, by the launching of highway construction programs so as to make possible the profitable development of small holdings, and by the encouragement of diversified farming.

This country, which has the most southerly town in the world, the highest falls, the widest river, the most extensive plains and the largest farms, has so many economic problems which are now history in the United States that the experience of American manufacturers, especially those of machinery, should aid their trade with the Argentine

The picture of Argentina's pastoral and agricultural problems is very similar to that of many parts of the western sections of the United States a generation ago. There are the same questions of the disposal of public lands, the encouragement of transportation, the stimulation of small homesteads, and the diversification of agriculture.

In view of this situation it has been inevitable that the Argentine should provide an unusually attractive market for American farm implements, automobiles, and other accessories to the development of a vigorous young pastoral and agricultural nation. In fact, last year this was the only country in South America which increased its imports from the United States over the year before. Since her products are strikingly similar to ours, our importations from her have been comparatively small. It supplies about nine per cent of our total wool imports (over 7 million dollars worth), 87 per cent of our imported linseed (over 33 million dollars worth as compared with 39 million dollars worth produced in this country), as well as large quantities of hides, skins and quebracho tanning extract.

There have been many Argentine complaints because this similarity of our products has unbalanced the resultant trade in our favor. This is doubtless true, but any attempt such as has been made by some agitators to capitalize this situation as a basis for hostility against the United States is entirely without foundation. The steadily increasing population in this country and the need for more and more Argentine specialties will bring on a gradual readjustment of that situation. In fact, in 1913 we took some 4.7 per cent of Argentina's total exports, whereas today we are taking almost 8 per cent. After all, this matter of adjusting the flow of goods from one country to another cannot possibly be arranged on the basis of assuring absolute parity of transactions. Trade is a matter of requirements and of ability to pay for those requirements. Commercial relations, therefore, in the international field move along triangular or polyangular lines rather than on the small two-way barter system. It would be impossibly idealistic to conceive of any two nations whose economic systems were so completely reciprocal as to set up an evenly balanced interchange of merchandise between them.

There has recently been much criticism of the tariff treatment of Argentine commodities by the United States. It can be pointed out that, whereas 60 per cent of our imports from Argentina are subject to duty, approximately 80 per cent of our shipments to the southern republic are dutiable. In our own case, of course, the point of view is that of protection for our agriculture, whereas the Argentine view is the equally logical one of the production of revenue on such high-priced items as automobiles, motion picture films and office equipment and to encourage native manufacturing.

Furthermore, the revenues collected by the United States in customs duties on the chief imports from Argentina were approxmately $15,500,000 in 1925 (the last available comparable statistics), which was approximately 3 per cent of the total United States customs revenues from all sources. On the other hand the revenues collected by Argentina from duties on imports from the United States in that year totaled approximately $31,500,000, which represented about 25 per cent of her total customs revenues from all sources.

On this matter of our imports from Argentina, another source of complaint has been that connected with the enforcement of certain of our regulations regarding imports and tariffs. There was at one time a requirement on the part of our authorities that 10 per cent of all alfalfa seed imported from Argentina be colored red so as to assist United States farmers for whose land the Argentine seed would not be suitable. Charges were also advanced by our exporters against Argentine regulations. Unexpected fines are often assessed in the Argentine

custom houses, frequently for what are considered purely minor clerical errors. The root of the difficulty seems to lie in the fact that Argentine customs inspectors share in the proceeds of such fines and regard them as part of their regular income; hence their zeal in enforcing every minute phase of the law.

In connection with the question of the trade balance, there is much discussion as to the possible inroads of recovering European exporters. In 1927 our major export items were very predominantly connected with the automotive trade, including $28,500,000 worth of trucks and passenger cars, $7,000,000 in gasoline, and $3,300,000 in lubricating oil. Europe is not an exporter in any quantity in these lines. The Argentine is our best foreign customer for trucks and our third best for passenger cars. If to these items are added other outstanding American export specialties, such as films, farm implements, office appliances, and production machinery, we discover that the bulk of our export trade to the Argentine was in no sense "stolen" from European traders. The determining element in our success is not the possibilities of our appropriating any European trade, but rather the steady advancement of living standards and buying power of the Argentine people.

Prompt registration of American trademarks in Argentina is essential in view of the Argentine law which allows only thirty days in which to protest a registration after notice of application in the official bulletin. Zeal in enforcing minute details of customs regulations is another point that must be watched by our exporters to this southern neighbor

This does not by any means imply a lack of competition between the United States and Europe. It is true that at present we supply about 94 per cent of Argentina's total imports of automobiles, over 90 per cent of her requirements of motion picture films, and about the same share of her purchases of foreign farm implements. European manufacturers are making strenuous efforts to introduce their lines and there will undoubtedly be some headway made by their manufacturers at our expense. The actual volume, however, of such transfers is not likely to be great. Today the Argentine is our leading Latin American market.

One very important angle of the relations between Argentina and the United States is the increasingly intimate financial bond. Our people have shown their faith in the stability and future of the Argentine public by purchasing bonds and securities to a total of more than half a billion dollars. Although British bankers have for more than a hundred years been financing the republic, there is evident now a tendency to turn to the United States. In addition to public flotations, there were numerous large private advances for railroad construction, for telephone systems, and other purposes. Over 60 per cent of the republic's packing industry is owned by Americans.

There are still many aspects of economic relationships with the southern republic which require careful attention. The differences in her commercial laws as compared with our own, necessitates scrupulous care on the part of American merchants, bankers, and others operating under her jurisdiction. Prompt registration of American trademarks in Argentina is very essential in view of the fact that misappropriation of American marks still occurs in that country. The trademark law of the Argentine allows but 30 days in which to protest a registration after the notice of application has appeared in the official bulletin. Unless American representatives, both official and otherwise, are unusually alert, this situation leads to the pre-emption of well-known American trade names by unauthorized individuals. This problem arises from the difference in the practice of awarding trademarks on the basis of prior registration as against priority of actual use.

Our trading operations are well served by efficient steamship services to Buenos Aires under the American flag; in fact, these vessels now carry the major portion of our freight and passenger traffic. However, we are in an unfortunate position with reference to aeronautical communication with the southern republic, so far as rivalry with Europe is concerned. A recent announcement of the German Lufthansa regarding the inauguration very shortly of air traffic between the Old World and Argentina, the operation of the Paris to Buenos Aires air-and-fast steamer service since last spring, and the announcement of plans for similar efforts by British air concerns, all indicate the attempt to capitalize the proximity of that section of South America to Europe. The problem of improved economic relationship between the two countries would seem to resolve itself, not into any question of respective superiority or inferiority on this or that item, or of seeking out a nicely balanced, logical, but entirely uneconomic and artificial parity of two-way commerce. The problem is rather that of discovering the many ways in which the economic and industrial experiences of each might be helpful to the other. It is indeed gratifying to observe the substantial progress that has already been made along this line and the encouraging promise thus afforded to the future.

Keeping Belt Costs Down

IN SPITE of the growing use of motor drives, belting continues to play an important part in machine operation. And it pays management to take an interest in belt problems, both as to securing satisfactory belts and in keeping the cost of power transmission down where it belongs. Good belting, for example, can be kept within $\frac{1}{64}$ in. plus or minus, of the specified thickness. A tension of 190 lb. per sq.in. gives good results; too tight belts affect both the belt and the bearings.

Heavy pulleys act as flywheels, and they frequently aid a belt in carrying its load easily. Pulley faces should be smooth and the belt should run true. Belts should be in charge of a capable man who is supplied with the necessary equipment such as belt-lacing machines, trimmers, and clamps. Belts should be inspected as often as necessary, and those not in use kept from damage while in storage.

Locomotive Rod Work at the Great Northern Shops

A number of the operations performed in the manufacture of main and side rods to illustrate the tools used

Fig. 1—Forging the smaller end of a main rod under a steam hammer. The rod is supported in the usual chain sling swung from a jib

AT THE ST. PAUL shops of the Great Northern Railway Company, main and side-rod forgings are made from billets in two operations. The billets are drawn out and forged at the larger end, on the first heat, then they are reheated and finish forged at the smaller end and sized to length. The forging is done under a steam hammer as shown in Fig. 1, where the smaller end of a main rod is being worked and the rod brought out to correct length. The work is supported in the usual sling chain so that the forging can be turned over easily as it is being worked. The pulley is suspended from a chain fall, which in turn is attached to a jib boom serving between the hammer and the heating furnace. The work requires three operators, two to manipulate the forging and a third to operate the hammer. The first machining operation consists of slabbing and edging, after which the contours are laid out. Next in line, the rods are channeled, profiled at the ends and then drilled and bored. The large ends of main rods of the floating-bushing type are first drilled, for a pilot hole, 2½ in. in diameter, and are then rough and finish bored. For rods of the strap-end type, 2-in. holes are drilled in the corners and the core is burned out with a gas torch.

Slabbing and edging are handled in a planer-type milling machine equipped with a universal fixture to hold either one or two rods, when slabbing is handled, and up to six rods for edging. The machine is shown set up, in Fig. 2, for edging a pair of middle-connection rods. The cutter assembly consists of ten 10½-in. inserted-blade milling cutters.

The ends of the rods are profiled, one at a time, as shown in Fig. 3. The rod is centered for this operation and is clamped over a locating plug. An additional U-strap is also used near the edge of the revolving table. The cut is completed in one pass of the table.

Instead of trepanning the large ends of the rods, the hole is cut with a solid fly cutter, guiding in the pilot hole. The cutter, held in a boring bar, can be adjusted for various diameters. The set-up is shown in Fig. 4, where an 11-in. hole is being roughbored. The cutter measures 3/4x1½ in. It is driven at 28 r.p.m. with 0.025-in. feed per revolution.

The fillet is machined next, as shown in Fig. 5. This operation is handled in the same machine and without changing the set-up made for the boring. As illustrated,

Fig. 2—Edging a pair of middle-connection rods in a slab-milling machine. The forgings are held in place by a three-section fixture that can accommodate up to six rods at one time. The same fixture is also used for slabbing

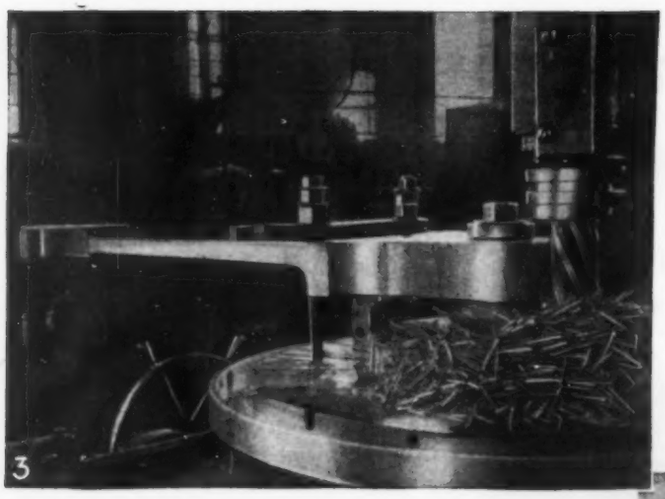


Fig. 3 — Rods are profiled singly in a machine equipped with a rotary table being supported and located at the center of the table by a plug. A helical cutter machines the radius in one cut

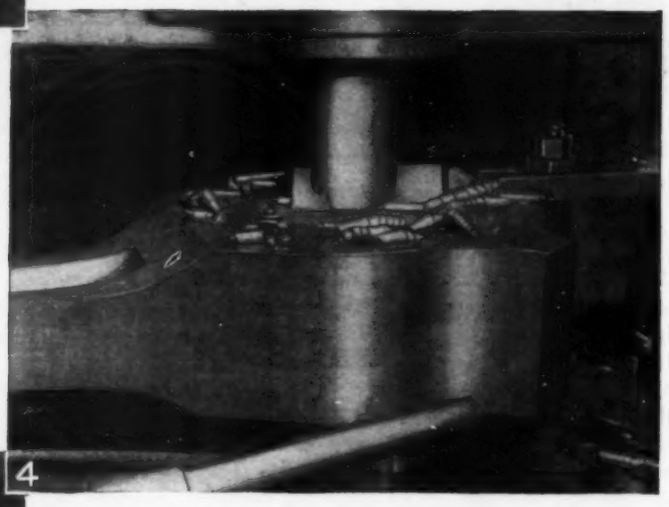


Fig. 5 — Cutting the fillet. This operation is handled at the same setting that is made for boring the large hole. After finishing one side, the rod is turned over to finish the other side

Fig. 4—The large ends of main rods are bored out by first drilling a 2½-in. hole through the end section, and by following with a fly cutter. The cutter is adjustable in the bar, so that various diameters can be machined

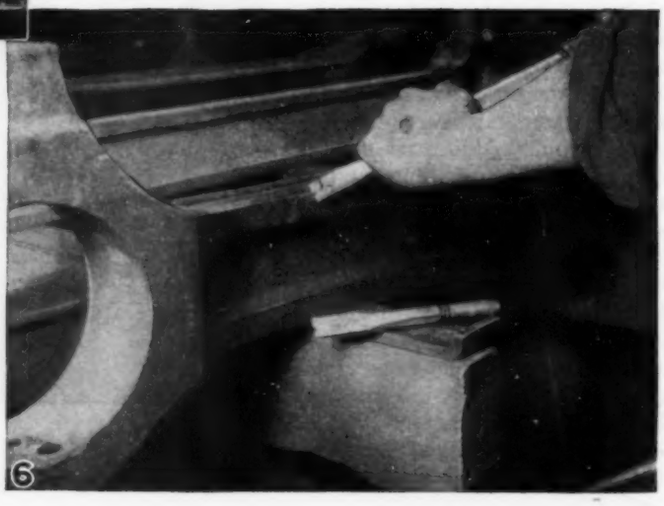


Fig. 6—An air hammer, equipped with a grooved chisel, is used to round the corners. The groove in the chisel is ground from both sides

the form tool is mounted in an adjustable head attached to the boring bar. The rod is leveled on the machine table by adjustable screw jacks, and is held in place by a machine vise. The fillet on the opposite side of the rod is handled in the same machine by reversing the work.

An air-operated hammer equipped with a grooved chisel is used to round the corners of main and side rods as shown in Fig. 6. The cutting edge of this chisel is grooved from each side and is made with a radius that corresponds to the rounding required on the rod. Chiseling is started at one end of the rod and is completed in one pass. The metal removed comes off in the form of a curled chip. Prior to the use of this tool, fillets were made by grinding and filing which required more time for completion.

Preventive Maintenance

By John Younger

Professor of Industrial Engineering, Ohio State University

THE words "preventive maintenance," as the late Frank B. Gilbreth would say, are thought detonators. They convey the impression of planning for trouble rather than letting trouble overtake you in its own time. A machine always chooses the most inopportune moment to break down. Perhaps you are in the middle of a complicated job, wanted of course in a hurry. Possibly you are doing it on the only machine that can do it, and when the machine breaks down your job stops, your man stops, and it costs you money to repair the machine again. What should be realized and emphasized is that it costs more money because of the breakdown of your planning and the enlargement of the unseen overheads that accumulate on the idle machine.

Perhaps the toolroom or the millwright department is already busy when you disrupt its schedule for the emergency repair of the broken machine. It costs money to break into that schedule. And you may have to pay overtime wages to make up the lost time, but you are only charging your customer straight time. That expediency costs money. It is the function of preventive maintenance to plan intelligently ahead of, and forestall, break-downs.

Manufacturers whose production is heavy enough on standardized articles can often afford to adopt what might be called a policy of rotation. The idea is to have about one machine out of every ten an extra machine not necessary for the proper balance of production, and have that machine in process of being overhauled and rejuvenated. The rebuilt machine is then transferred to the production line, displacing a machine which in its turn is inspected and possibly overhauled.

Naturally, such a policy must be pursued with judgment and common sense. The period during which the machine is in the production line awaiting its turn for overhaul must be about the time requisite for the machine to wear to the overhaul stage. If the period is too long, you will be faced with unexpected breakdowns. If the period is too small, you are really overhauling machines that do not need it. It is usually preferable from an economic standpoint to follow the latter policy, but no law can be laid down. Experience is the only guide.

It is obvious, of course, that the smaller or diversified product manufacturer cannot always apply this idea. He is faced with the task of making the most of every machine he has with no possibility of adding "spares" to his equipment. But, at the same time, there is no reason why he cannot plan for his break-downs in such manner that he can anticipate them to his economic advantage. If we can foresee when a machine is in need of repair, then we can plan for the most opportune time to take the machine out of production for doing this overhauling.

Perhaps the simplest way is by a co-relation of time study with the work of the machine. When a machine is new or in good condition it is able to reach the desired quality of work in a certain minimum time. The tool does not produce chatter marks, the finish desired can be reached quickly, the tool can be set to the desired depth of cut with absolute precision because there is no backlash in the table screws. But when the machine wears the causes of delay multiply and the original time is overrun. If an average skillful worker cannot meet this time due to the fault of the machine, then clearly the machine is not up to standard, and should be brought up to it.

The above policies take care only of normal wear and tear. Nothing has been indicated as to what should be done to prevent delays due to breakage of parts. This problem is most difficult. It is not always easy to inspect the parts of a machine, and yet a system of inspection for small cracks and distortions, properly carried out, will prevent many a break-down.

The Best Test

By E. Ackerman

THE ideal test for every appliance is to subject it to actual service conditions. Tools should be run at their ordinary cutting speed; bearings should be loaded with their rated loads; and machine parts, in general, should be subjected to the wear and stresses of ordinary service. If the results obtained from such tests are recorded, accurate conclusions may be reached.

There are, of course, instances when it is not possible to make the tests under actual service conditions, because too much time might be required to arrive at accurate conclusions; but even then a reasonable additional load should be placed upon the device being tested, so as to determine what might happen under an occasional, but reasonable overload.

Some engineers conduct tests of tools or machine parts by overloading them and noting the results; force or pressure being applied until breakage takes place. But destructive tests do not give a true picture of the capacity of the tool for performing its intended service.

Industry—highly organized for mass or quantity production—has found that it pays to protect the health of the worker by giving him plenty of light and clean air and by removing the causes that formerly were a menace to his physical well-being and made accident easy.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Whistling in the Shop

"I WONDER if I can get Williams to put up a notice against whistling in the shop, Al? That new 'bird' in my department almost drives me to drink."

"It's a safe bet you can't, Ed. Williams isn't long on rules, and when it comes to curtailing a man's display of exuberance, or whatever you call it, he wouldn't dream of it."

"But this man's a nuisance, Al."

"Why not tell him so—in tactful language, of course. Tell him you don't mind a man's whistling, but that it isn't just fair to the gang to make it so loud."

"But I do mind it, Al. I hate whistling, anyhow. And when some of these birds of mine try to sing, I could brain 'em."

"If that's just an occasional feeling, Ed, you better watch your diet. Something isn't agreeing with you. If it's a regular habit of yours, you better get examined. You don't belong in the shop, or anywhere that various kinds of people congregate, because most individuals must have some way of 'blowing-off steam,' whether it's gladness or only a grouch—and grouches don't sing. Snap out of it, Ed. Be yourself!"

"Do you mean to say you like to hear them whistle and sing? I thought you liked music, and you can't call that music."

"As singers, most of my men are a dead flop, and the same goes for whistling. But if you'll just call it an expression of more or less happiness, it sounds better, and I like to hear them. A man with a plot against you or his neighbor doesn't sing—or whistle. The plotter is a quiet bird."

"Well, I think it's a nuisance, Al. I also think it interferes with the work more than you realize. The best man I have never whistles or tries to sing. I don't believe it tells a thing about a man's feelings."

"There's where we differ again, Ed. I'm dead sure that the average man feels better when he can relieve pressure by whistling a bit or even singing. Some can't do either; I've known a few of 'em. But a man who does express himself that way is usually a lot easier to deal with."

"And you'd let them make all the noise they want to as long as they call it singing? Well, I wouldn't," said Ed with emphasis.

"Exaggerating again, Ed. No man has a right to annoy his neighbor, even when he calls it singing. And a gentle hint is usually enough to calm down the loudest would-be Caruso. But there are mighty few shops that are not noisy enough to drown out the average voice a few feet away. And I certainly wouldn't try to post any rules against singing or whistling. It's up to the foremen to see that it doesn't become a nuisance."

Should all whistling and singing be prohibited, as Ed suggests? Or is Al right that it's a good sign in itself? And is it up to the foreman to keep it within bounds?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Letting Small Savings Offset Larger Wastes

ALL tools, regardless of size, should be checked out to the workers. This will mark their location in the factory and fix the responsibility for their return. Furthermore, the worker will see that the company is interested in small savings, and he will be influenced into taking greater care of the tools he uses.

Inspection of tools can be aided when their location in the factory is made possible through the aid of a tool check system designed to identify the workman in whose possession a particular tool will be found and also to indicate all tools which have been issued to any particular workman.

—A. DAVIDSON.

Reading the Shop Language

UNSKILLED labor is also unskilled in other things, and unless the operators are exceptionally intelligent, it would be difficult to teach them how to read prints. Even experienced draftsmen occasionally find it difficult to read complicated drawings. Even simple sketches can be misread by operators trained in blueprint reading, unless they are really bright men.

The problem can be solved by only taking on new men who are intelligent enough to warrant training, by training the better type of men in the shop, and by taking on men who are already trained.

—F. W. OLIVER WHITE, *England.*

Asking a Man to Come Back

HAVING gotten himself into a tight corner, Ed, being an honorable fellow, will swallow his pride in order to give the real article elbow room. After all, it is only the man who never does anything, who never makes a mistake; and that is *the* mistake, after all. The man he fired will at least recognize that Ed is a square man. All decent men will share that opinion. But in any case, suffer as he may, Ed will not suffer nearly as much as he would if he failed to act honorably after an act of unintentional injustice.

—W. R. NEEDHAM, *England.*

The Boss's Son in the Shop

PERHAPS no one will be more interested in the discussions evolved by the above topic, than I, because I once was a boss's son in a fair-sized machine shop. My father introduced me to the men who were to try and develop my mechanical abilities, should any be latent, and who, if necessary, could box me over the ear. The foreman would "bawl me out" until my ears burned with shame. I could not tolerate being "bawled out" by my father's foreman and friend, so I had to do my best.

Summer vacations were spent in the shop. I was summoned to do everything from sweeping the floors to regular machine work. It was during these years that I gained a good deal of practical experience, of both mechanical and human nature. At college I appreciated the fact that my father's workmen did not treat me as their boss's son.

Often while working for my father I had a desire to go and work elsewhere. Some men would encourage this idea as a means of broadening my knowledge and others would think I was foolish to leave my father's shop with such "wonderful chances around." So, I remained after much deliberation. I learned facts that would have taken years to acquire. Why? Because the foreman, as well as his workmen, would from time to time call to my attention something peculiar about a difficult job, or tell me some wrinkle, and teach me the proper way to grind tools. Sometimes they would tell me of their past experiences in other shops.

I might add that as for discipline I was treated more severely than any worker. Punctuality happened to be one of my father's virtues—and he emphasized it greatly on me. Being a boss's son entertains a certain weakness and that is that the workmen are too willing to help. If this is encouraged, one will develop the habit of looking for help before it comes.

—PETER E. MCMANUS, JR.

Equipment and the Foreman's Reputation

IT IS a first principle that the foreman must be held responsible for the efficiency of his department. This does not necessarily mean that whenever the foreman asks for new equipment the management must purchase it, but it does mean that the foreman must keep his existing equipment in good running order so that the maximum output may be obtained.

It seems rather foolish of Bill Jenks to resign his position when he has given no real reason why new

THE·NEXT·TOPIC

Al Orders an Emergency Pump

ADVANCE QUESTION

Al "takes the bull by the horns" and orders a pump in Williams' absence. It was a breakdown job and they needed the work. The treasurer "called" Al—and Ed thinks perhaps he was right. How about it?

equipment should be purchased. If Bill found that his costs were too high, or that his production was held up too often, owing to shut-downs for repairs, he should have brought it before the management. Also, he should have shown the relationship of the cost of the proposed new equipment with the estimated reduction in the cost of production.

The foreman's reputation is not made by his ability to get the management to purchase new equipment, but rather in getting the maximum output from the existing equipment, and also by his ability to show the management ways and means of getting a better product or of reducing production costs. I believe, however, that if Bill had played the part of a real foreman, he would have had his new equipment.—R. A. MAXWELL, *Canada.*

Making Foremen—or Importing Them

AL IS right in defending Williams, but only if the foreman he is nursing has very decided possibilities. Otherwise Williams is making a mistake. It means that he is losing a chance of improving and modernizing his toolroom methods, and, concurrently, of speeding up production.

If a foreman is not equal to his job no one will see this as quickly as his men, and those of them who are ambitious either slack off, or leave. In my considered opinion, therefore, it would not discourage the men more to have a new foreman from outside who obviously knows his job, and from whom they can learn something, than to continue to take orders from one whom they all see to be inefficient. —J. M. BOYLE, *England.*

Capitalizing Criticism

CRITICISM of different departments by a committee composed of foremen has proven many times to be both constructive and helpful. No one is in a position to offer sane and valuable advice like a foreman; indeed if he could not, he would never be a successful supervisor of a department.

We humans, naturally, cannot see our own failings from the same angle that our neighbors can view them. Thus, it pays us to be open to conviction. This principle applies to our departments, and perhaps an illustration would be in order.

Four departments of our machine and steel erection branch each maintained their own scrap pile consisting of miscellaneous stock ends, and sections of machinery. This practice had been in vogue for years and each pile would be combed daily by the foreman in search of some piece of stock or other article required. A member of the efficiency committee, a foreman woodworker, by the way, suggested that instead of maintaining four piles of stock, that a location handy to all four departments be chosen. —F. E. BIRD, *Canada.*

CONSTRUCTIVE criticism is of great value if given and received in a spirit of fair play. Criticism may be presented in a way that begets confidence, and inspires teamwork, or it may be done in such a manner as to antagonize those that it should benefit.

Ed may be a fair foreman, but so accustomed to a regular routine that he does not notice that some of his methods are out of date, or that his machines are not arranged to advantage. But, if he goes into another department he may see several opportunities for improvement, all of which can be discussed at a gathering of foremen, and possibly some one will wake Ed up to some of the shortcomings in his own department.

—F. H. STEBBINS.

ALTHOUGH the principle behind the idea of encouraging foremen to criticize each other's methods is admirable, it is almost impossible to maintain harmony, since many of them have nothing in common, and nothing is more resented by human nature than the intrusion of the other fellow.

Since it is desirable to maintain a feeling of mutual trust between various foremen, it is not wise to play with fire to the extent of exposing the less talkative man to the criticism of the born orator. It must be admitted, however, that if an outside opinion can be brought to bear upon any unusual difficulty and coupled with that of the foremen, the result is far more satisfactory than if treated by one individual only.

—L. R. DORIS, *England.*

Does Appearance in Tools Count?

THE practice in our shop has proved that Al is right in trying to convince Ed of the fact that appearance in tools does count. It is a fact that operators treat the nice looking tools much better than scabby looking ones, and it is curious that this is still more true for female operators. We have female inspectors that treat the gages very rough; they let them drop, throw them from a distance onto the work-benches, and the job is handled in the same careless way. After giving the same persons nice looking gages, they are handled with care, have a longer life, and are used with more acuracy.

—M. L. J. JOCHEM, *Holland.*

Getting Ideas from Other Shops

ONE of the two items picked up by Jake Shimer in his visits to other shops has been used for years in some of the shops of a large railroad, without involving the least bit of extra bookkeeping or even requiring the small brass identifying tag.

This road uses a standardized piecework ticket for all overhauling, space being provided on the back for the names of the mechanic and helper doing the particular job. If, for example, the gang foreman assigns the job of refitting a throttle to A. Martin, his is the name placed on the piecework slip, and his, the payroll sheet credits with the money earned. After a locomotive is ready for the road, the shop foreman's clerk collects all these piecework slips into one lot, ties them into a bundle marked with the number of the locomotive and the date it entered the shop; and these bundles are then stowed away for reference.

Suppose the throttle gives trouble after the engine is put on the road and it is desired to take official action on the defective work. It is a simple matter to refer to the files, get out the piecework slip showing the throttle overhaul, and see who is responsible.

—ELTON STERRETT.

Brass-working section of the machine department

Tooling Methods in a Canadian Shop

By Frank C. Hudson

A few examples of special tools and work-holding fixtures in a shop that is nearly a century old

AT ST. JOHN, New Brunswick, the plant of T. McAvity & Sons, Ltd., has been in existence for practically a century. It started in 1834, in a small manner, to supply ships' hardware and similar material which it had to fabricate for vessels that called at St. John in those days. It gradually increased until it manufactured valves and fittings, making all parts of valves on hand screw machines. From a small beginning it gradually grew up to the large plant which it is today, employing a little over 600 men and manufacturing all kinds of brass and iron valves, locomotive specialties in bronze and steel, pulp-mill digester fittings and blowoff valves, besides marine and commercial goods. The variety of work done and the lack of large volume precludes the use of methods found in mass-production shops making similar parts. There are, however, many ingenious tools and fixtures that have been devised and built to increase output and lower costs, a few of which are illustrated herewith. Steam injectors, largely for locomotive use, are an important item of manufacture. Instead of swinging the injector body in the gap of a large turret lathe, as was formerly the practice, the turret on a lathe has been replaced by a fixture, or holding block, as in Fig. 1. This block is shaped to fit the injector body and holds it in correct alignment for the various operations. As shown, the end connections have been threaded and the inner chambers are being bored and tapped by the boring bars and taps shown in the machine and on the lathe bed. The cross-slide on which the fixture is mounted permits the location of the body in the proper position to bore both chambers. Other lathes have been fitted up with special chucks, or devices, for holding the bodies of valves, as shown in Fig. 2. Suitable hoists are provided for han-

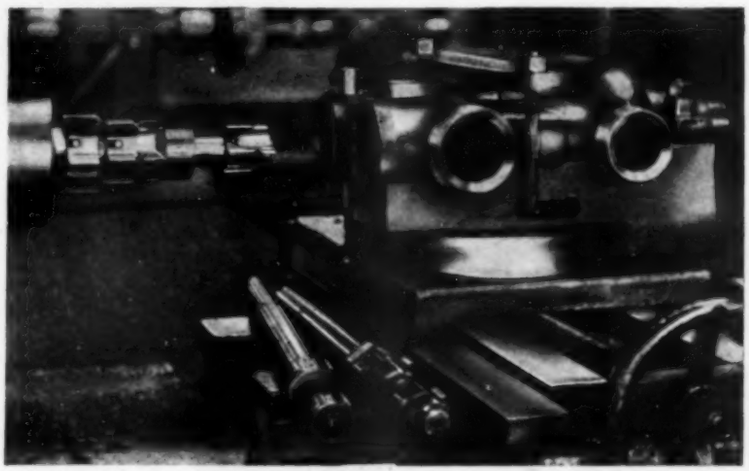


Fig. 1—Method of machining injector bodies. The usual turret is replaced by a holding fixture and the tools are revolved and fed by the machine spindle. Cross movement of the slide permits boring and threading at the desired points

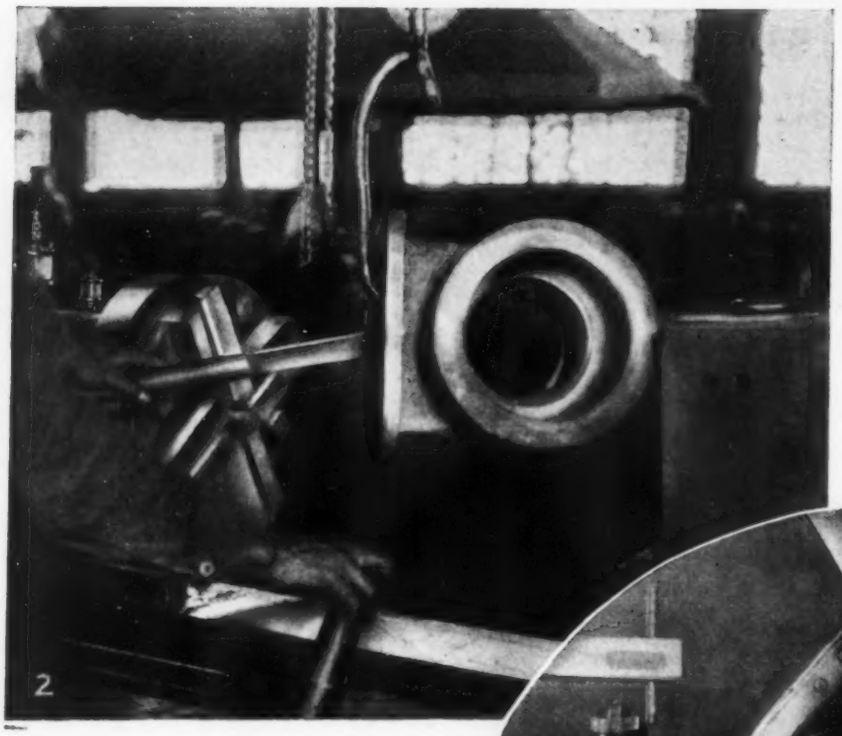


Fig. 2—Facing, or swiping, the bonnet surface on the valve body. Broad, high-speed steel cutters are used and extra heads with sharpened cutters are kept ready so as to avoid delay. Valves are faced at the rate of 27 an hour, indicating the effectiveness of the handling apparatus

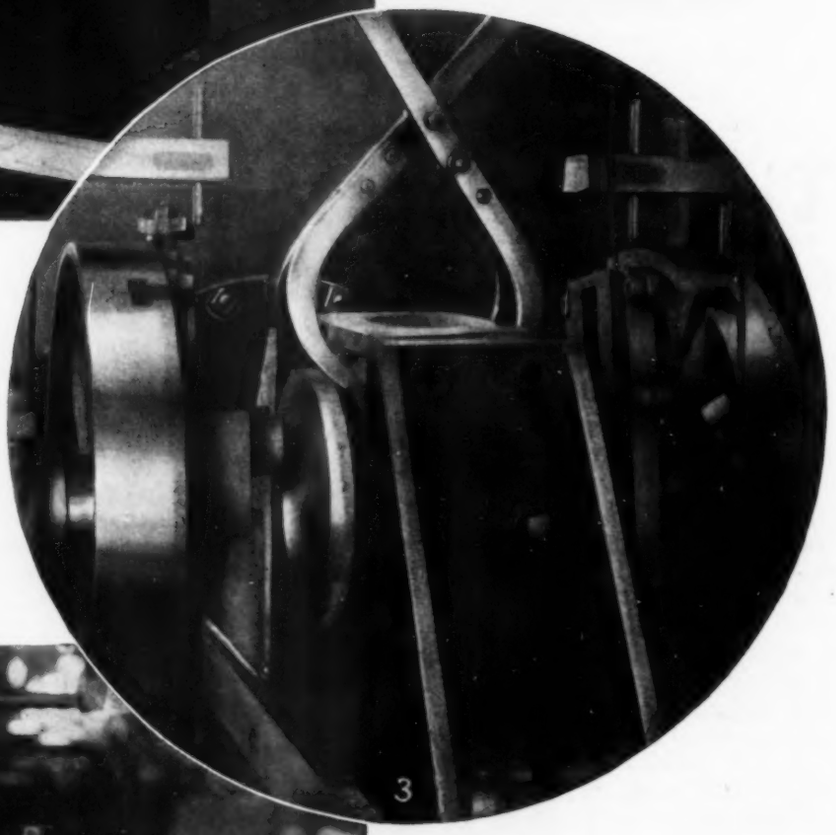


Fig. 3 — Air-operated fixture for facing both ends of the valve body at once in a double-ended lathe. Each head carries a single-point facing tool operated by a star feed. High-speed steel is used on iron and steel castings, and Stellite for roughing cuts on acid-resisting bronze

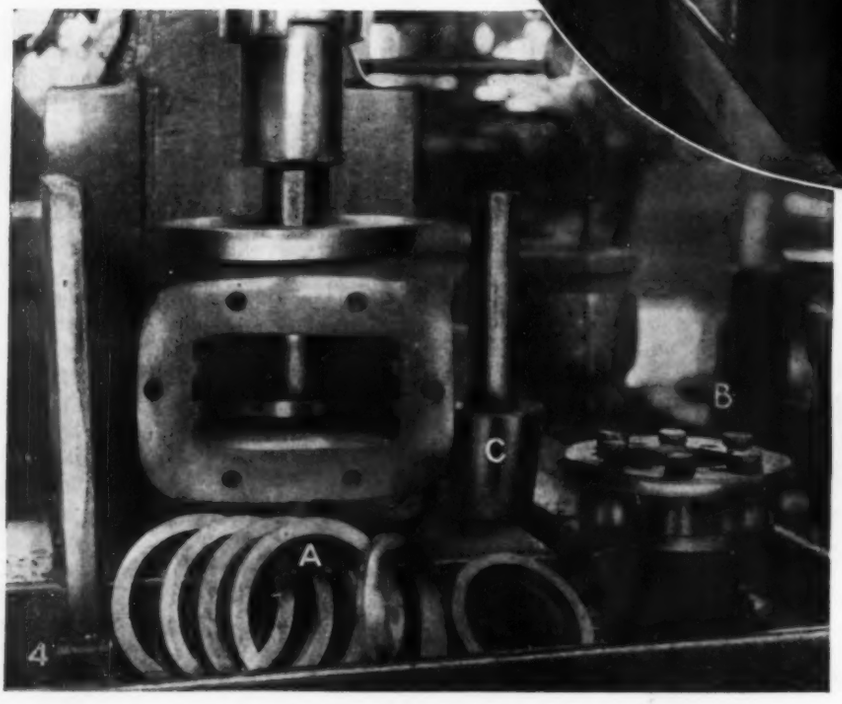
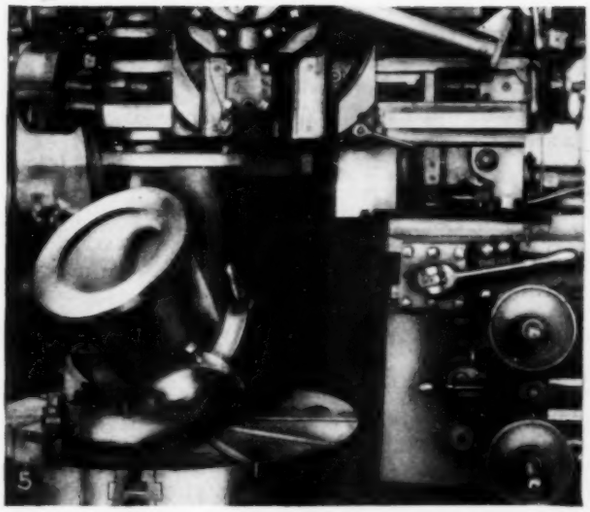


Fig. 4 — Special roller tool for expanding bronze seat-rings into the valve bodies. The ring is put in place, and the rollers put inside the ring. The cone, revolving inside the rollers and feeding down, expands the ring in place



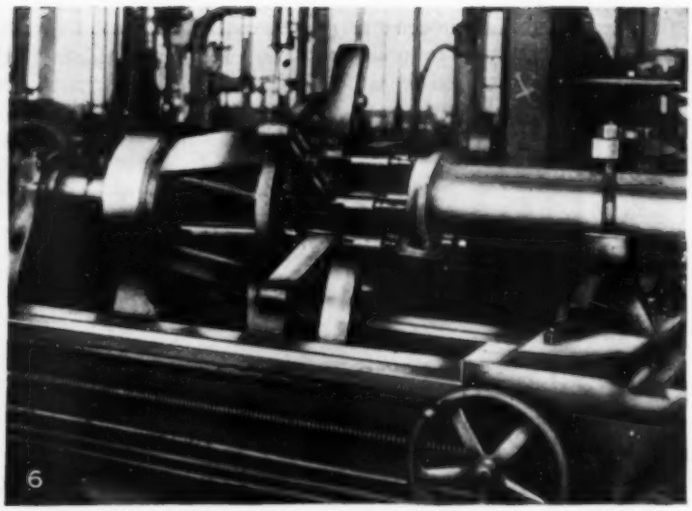


Fig. 5—Facing one end of a Y-fitting on a vertical lathe. By providing a suitable angle plate, the surface to be faced can be brought central and parallel with the table. The work is held by clamps on the flange and the angle plate. Fig. 6—A special lathe set-up to drill all the bolt-hole flanges at once. The multiple-spindle drilling head is mounted on the lathe bed, and is adjusted for the flange to be drilled. Fixtures on the lathe locate the pipe, and the longitudinal feed brings it to the drills. Pipes of any length may be drilled in this way.

dling the work in and out of the chucks, and air is employed to operate the jaws that hold the bodies in place. In the operation shown, the top, or face, that receives the valve, is to be faced, or "swiped" as it is called in the shop, by means of the heavy, four-bladed facing cutter shown. The ease with which the operation is performed can be judged by the fact that a man faces 27 valve bodies an hour in this machine. Three sets of cutters are provided, so that a sharpened set is always ready to replace one that has become dulled. The cutters for iron or steel castings are of high-speed steel. For cutting acid-resisting bronze, it has been found best to use Stellite for roughing and high-speed steel for finishing.

Both end faces are machined at one setting, and are held in the air-operated fixture shown in Fig. 3. The back jaw is movable and the air cylinder is just visible behind it. Instead of using long-bladed swiping cutters for this work, the double-headed lathe has faceplates provided with slides carrying single-point tools actuated by star feeds. Here, too, a suitable hoist and lifting tongs make it possible to handle the work easily.

One of the special tools used for rolling bronze seats into place in the valve bodies is seen in Fig. 4. The operation is performed on a heavy-duty drilling machine, the body being prevented from turning on the table by a stop in one of the table slots. The bronze seat-rings, *A*, are put in place in the valve casting, and the roller tool at *B* is placed inside the bronze ring. The rollers are mounted on their studs with sufficient play to permit all necessary expansion by the steel cone, *C*, between the rollers and the valve body. With the rollers in the ring and the cone in the machine spindle, the cone is fed down as it revolves, and so forces the rollers against the inside of the bronze ring, rolling it into the undercut in the body and making it a tight fit in the body casting.

In Fig. 5 is shown the way in which the large Y-connection is handled on a Bullard vertical lathe. An angle plate is bolted to the table and the work is held by four C-clamps. By providing similar angle plates, flanged fittings of different angles can be machined.

Drilling flanged ends of long pipes is an awkward job at best. The use of vertical machines means a deep pit in the shop floor, which has many disadvantages. For such work the multiple-spindle drilling head shown in Fig. 6 is mounted on a lathe of suitable size. By providing suitable supports for the pipe, both on the lathe carriage, as shown, and at the other end, the pipe is easily located, and held for drilling. A plain disk, or ring, drill jig, clamped to the end of the flange, as shown, insures the correct location of the flange holes. All the holes are drilled at once. The pipe is fed to the drills by the longitudinal feed of the carriage.

In a business as old as this, the number of patterns

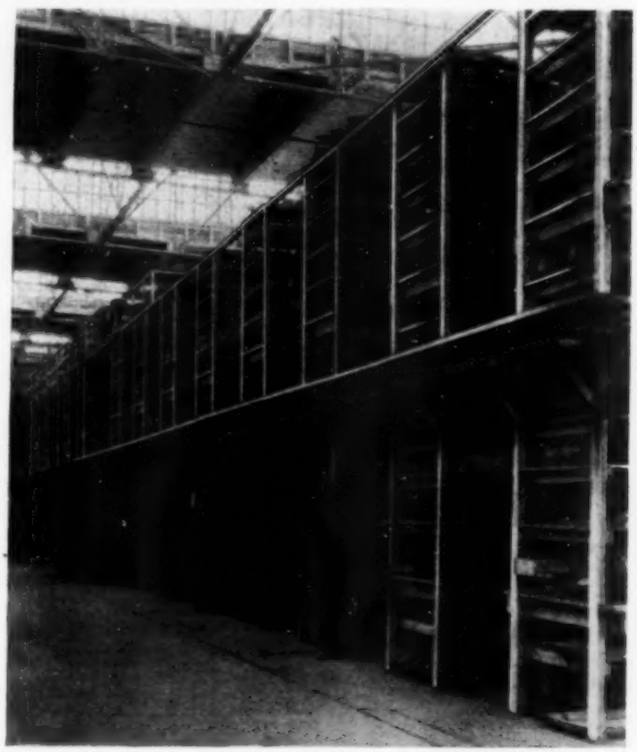


Fig. 7—Storage racks for patterns in frequent use. The racks are double-decked, and are connected by an upper platform. Ample fire protection is assured by closely-spaced automatic-sprinkler heads

that accumulate assume tremendous proportions, and the problem of storage becomes serious. Patterns seldom called for are kept in a separate storage room, but current patterns, those likely to be needed frequently, are stored most conveniently as seen in Fig. 7. The racks are double decked, and are connected by a platform for convenience in reaching the upper tier. The shelves are not solid, the boards being spaced so as to leave openings for the passage of water in case of fire. Automatic-sprinkler heads are supplied at very close intervals.

Obsolescence of Production Machinery

By K. H. Condit
Editor, American Machinist

THE *American Machinist* survey begun in 1925 showed that 44 per cent of production machinery used in metal-working plants was at least ten years old and consequently obsolete because of the introduction of new designs. What the situation is in other industries no one knows because, to my knowledge, there has never been a careful survey of obsolescence in other fields. The chances are, however, that it is much worse because no other industry has made advances comparable with those of the metal-working group.

By reason of the relative backwardness of some of the other industries it would probably not be fair to set the 10-year mark as the obsolescence deadline. New equipment has not come along so rapidly. On the other hand, one of the reasons why these industries have not been satisfactorily profitable is because they have not been supplied with good enough production equipment.

In the first place, what are the reasons for replacing obsolete equipment? Why not keep on using it until it is unquestionably worn out? Here are a few of the reasons that are given by some of the most active replacers:

Heavier, sturdier machine needed for severe requirements of today.

A better method has been discovered and requires the use of a different type of machine.

The present machine requires too much hand labor.

It is desired to change to direct motor drive with its attendant advantages.

Shop costs are too high and must be reduced.

Existing machines involve too many re-operations. A modern one will do several at once and cut down the inter-machine handling cost, and inspection cost.

To eliminate dirty or exhausting jobs.

Enlarged production schedules demand machines that will be more economical of floor space.

The next question is how soon should a new piece of equipment be expected to pay for itself?

Opinions differ. Some companies do not set a rigid limit, others do. One company makes the limit two to five years; another two years, others think one year is long enough. A railroad repair shop believes six or seven years will answer. An automobile company insists that special-purpose machines must return their cost in one run of cars, 10,000 to 15,000 units. An engineering change in the next run might make the machine obsolete.

The third question is how should we go about buying new equipment?

This question bears on the main topic because on the way in which it is answered depends the success of a modernization campaign. For instance, in one plant everything is carefully arranged so that the foreman, although he may not have originated the idea for a new piece of equipment, thinks he did and signs the requisition for it. The result is that when the new equipment reaches him he feels an obligation to make it do what he said it would. In other plants requisitions originate with the superintendent, the master mechanic, the plant manager, an equipment engineer, the time study department, a research engineer, the efficiency engineering department, equipment specialists, or the tool supervisor.

Another point to consider is the machinery for reaching a decision on when to replace a piece of equipment. For example, some companies keep elaborate records of the repair costs on their equipment. Such records certainly are useful when it comes to making a decision on a replacement, but, after all, repair cost is only one factor to be considered. There is the disposition of the old machine. Should it be traded in as part payment on new equipment, transferred to some less exacting service, sold outright, scrapped, or rebuilt? Failure to consider the best way of disposing of obsolete machines, a way that will be fair to all concerned, may very well wreck an obsolescence campaign.

Referring once more to the 1925-26 survey conducted by the *American Machinist* let us take the obsolescence percentages by industries.

Industry	Per Cent
Agricultural Machinery and Parts	64
Cash Registers and Calculating Machines	34
Electrical Machinery, Apparatus and Supplies	34
Engines, Steam, Oil and Gas, Waterwheels	28
Pumps and Pumping Machinery	52
Textile Machinery and Parts	55
Typewriters	55
Other Machinery Parts and Job Shops	50
Motor Vehicles	25
Motor Vehicle Parts and Bodies	29
Class I Steam Railroad Shops	52
Bolts, Nuts, Rivets and Washers	64
Screw Machine Products	64
Edge Tools, Cutlery and Hand Tools	56

There is more work to be done in some divisions than in others, but no one of them is as nearly up-to-date as it ought to be.

The *American Machinist* has been plugging away at the job of reducing the amount of obsolete equipment in use for years, aided by a concerted effort on the part of its advertisers in the machine tool group. Tangible results were hard to trace at first but during the last few months the statement is being made more and more frequently that a large part of the splendid current business of the machine tool builders is coming from replacements. The fever is even infecting the machine tool people themselves. One maker of a rather expensive precision machine said recently that half of his business was coming from machine tool builders.

Abstract of a talk presented before the General Machinery Group in Washington, D. C., on February 14.

Wing Assembly for Naval Planes

By Fred H. Colvin
Editor, American Machinist

The last of a series describing the manufacturing methods used at the Glenn L. Martin Plant

THE methods used in the fabrication and assembly of wings for Naval planes differ considerably from those used in other airplanes. The reason for this is that these particular planes are designed for storing between decks on airplane carriers of the "Langley" type, and their wings must be quickly attached and detached.

So great are the strains set up, and so small the factor of safety, that it is felt that the positive assurance of strength in a riveted joint is preferable to the probable strength of a welded one, and that the additional weight is justified.

To facilitate storage aboard ship, they are designed so that no part extends sidewise, beyond the landing wheels, either at the front or rear. The wings on each side are removed as a unit, false struts being inserted at the inboard end to preserve alignment while being stored.

With their fabric covering, airplane parts appear flimsy but the illustrations tell quite another story. The rudder for instance, Fig. 2, has a tubular, and a rectangular beam the full length. The cross braces through which these pass are of sheet aluminum alloy with large holes to lighten them, and the edges of the holes flanged over to add rigidity. Diagonal braces between the two beams and the cross braces strengthen it still further.

Equally strong and of somewhat similar construction is the stabilizer shown at Fig. 3. The cross braces are similar but the full length beams are of box section and somewhat heavier than those used in the rudder. This, and the assembly shown at the right, are the rigid part of the equalizer, the six gudgeons to which the movable parts hinge showing clearly. It will be noted in most, if not all, of the illustrations that the quantities in process

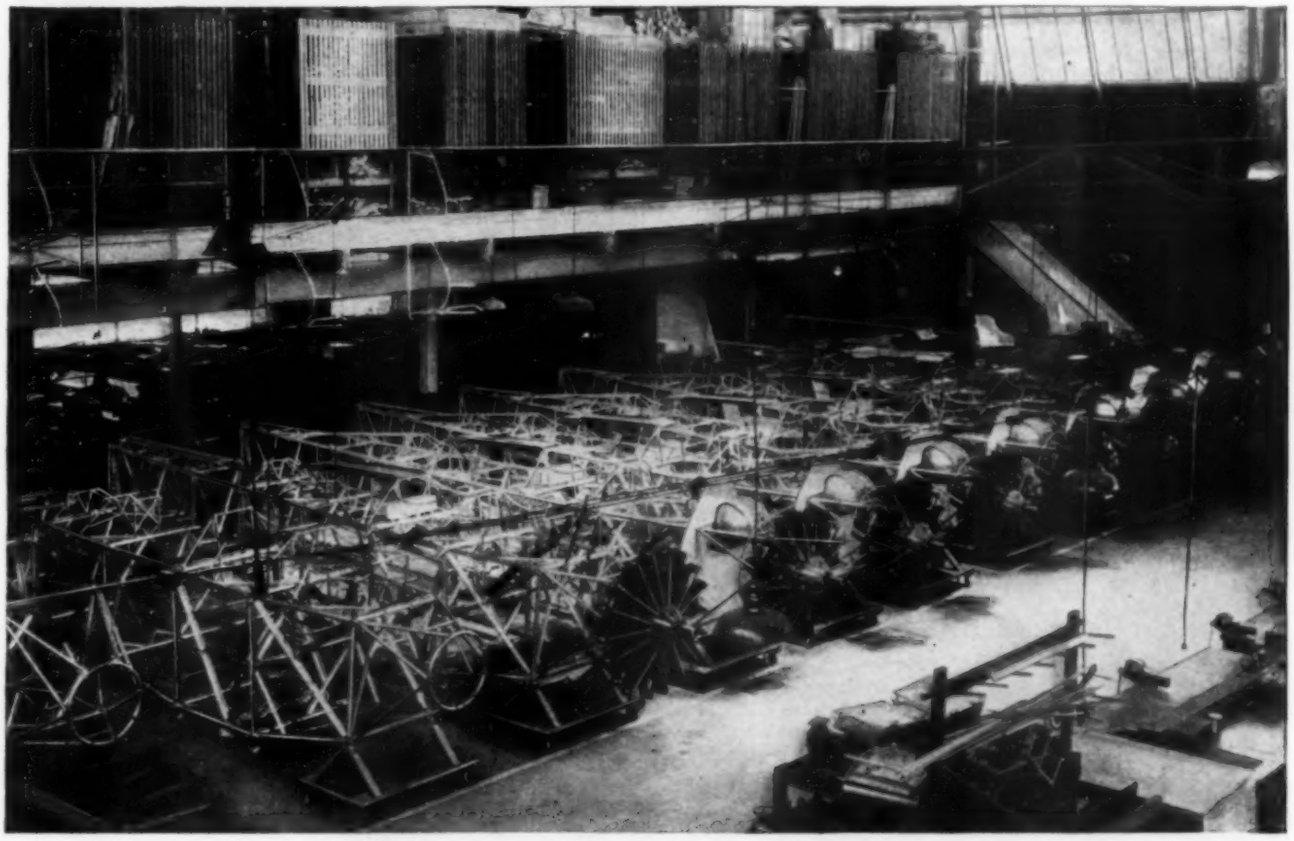


Fig. 1—Assembly line of Naval planes. Each carries a 525-hp. Pratt & Whitney Hornet engine. The wings are not attached until the planes are ready for flight

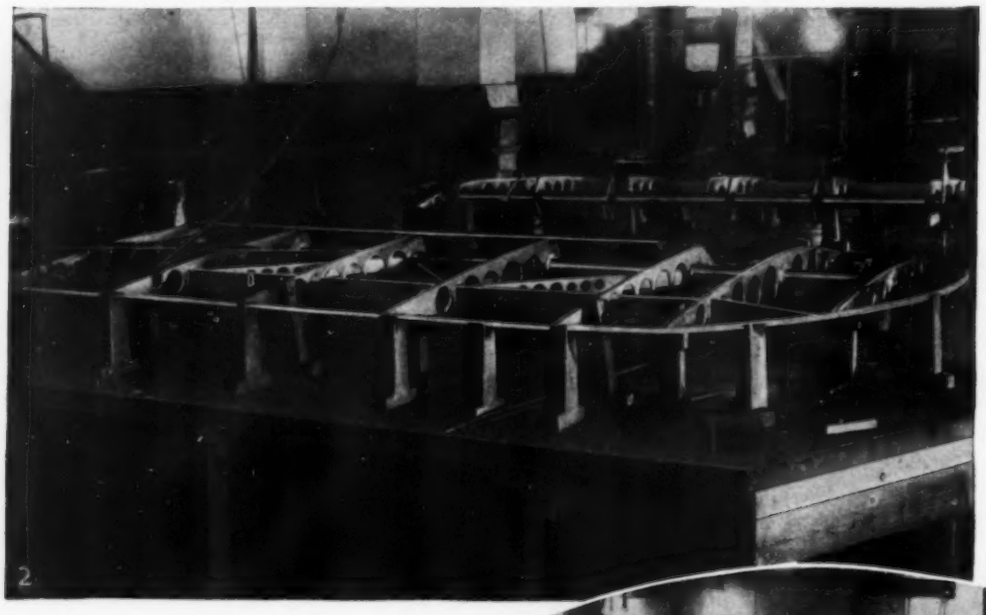


Fig. 2— Rudder assembly showing ribs assembled on two tubular beams. Angular cross bracing adds further strength

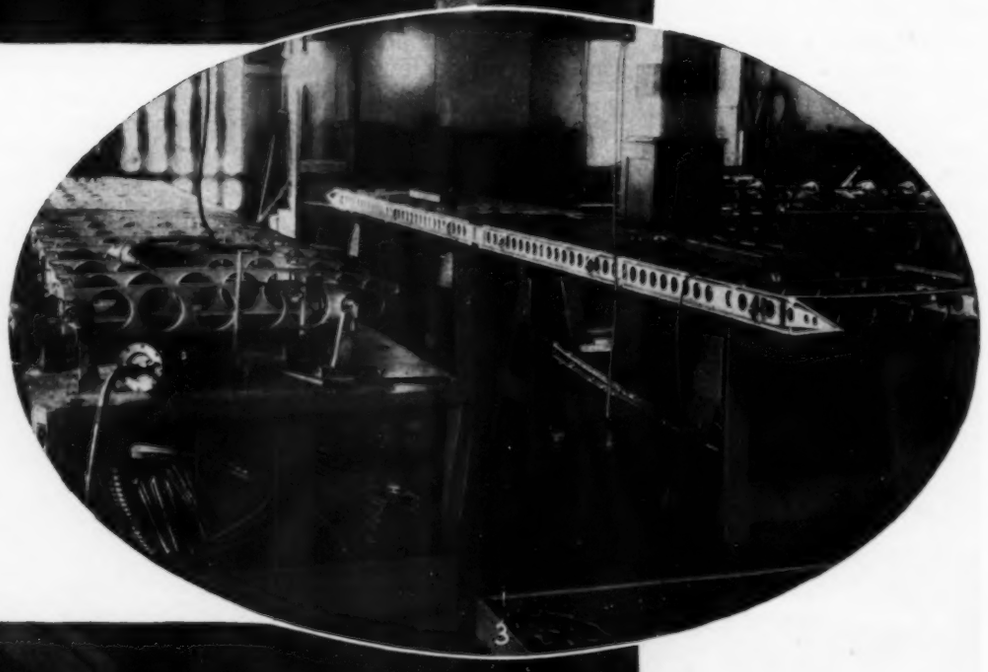


Fig. 3—Stabilizer for rear of fuselage. This shows the stationary part, and the gudgeons to which the movable parts hinge can be seen along the front edge

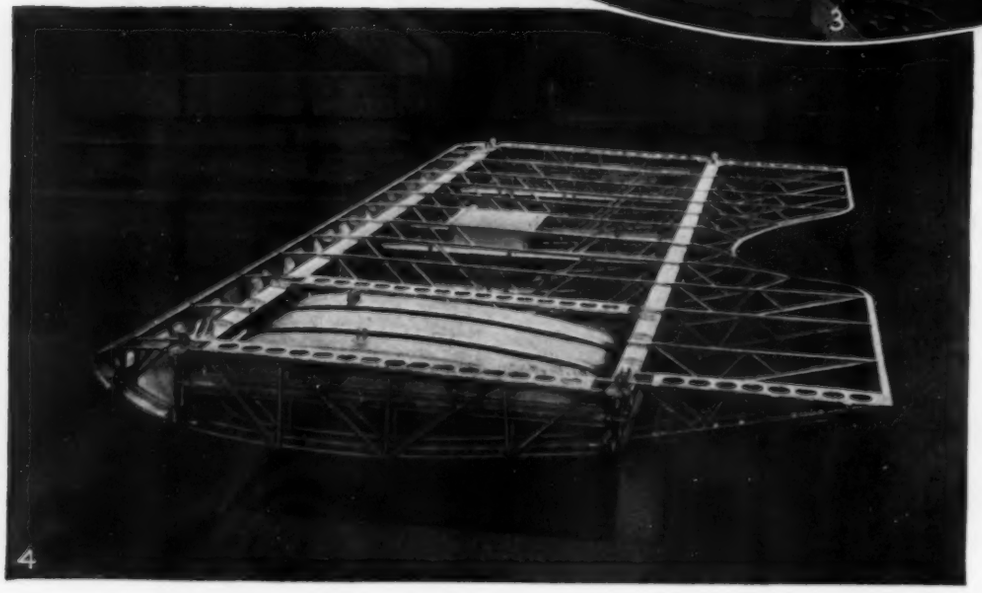


Fig. 4—Midship section of upper wing, complete with nose cover, fuel, and oil tanks, ready for covering. The section is shown upside down

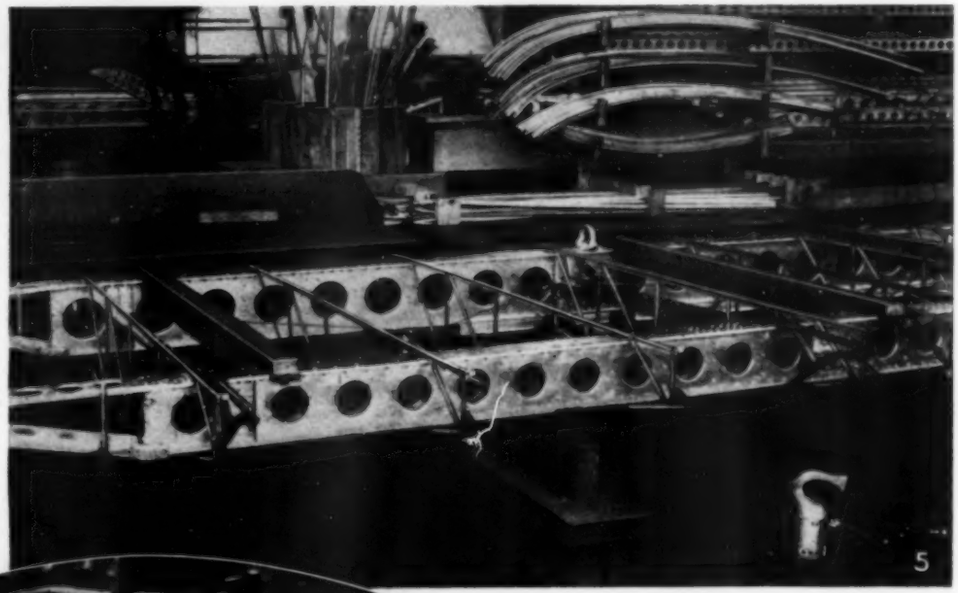


Fig. 5—Front and rear wing beams, with fore and aft ribs in process of assembly. Note the number and closeness of rivets, no welding whatever is employed

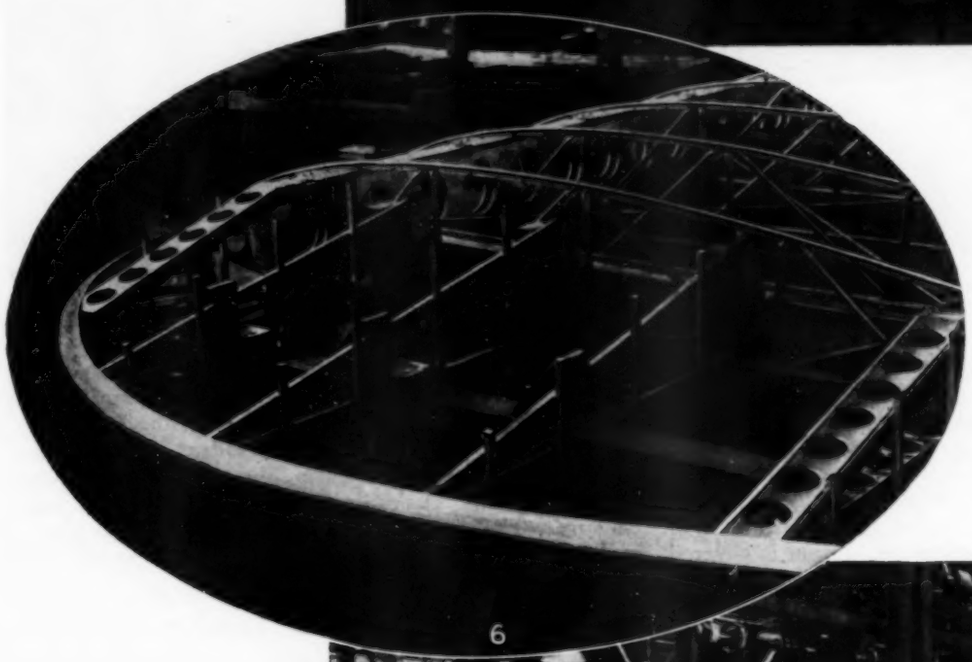


Fig. 6—Uncompleted wing-tip, the bracing at this point is at right angles to the rest of the wing. The ends of the wing beams extend into the tips

Fig. 7—The nose or front edge of the wing is covered with a sheet of aluminum alloy, over which the fabric cover is stretched

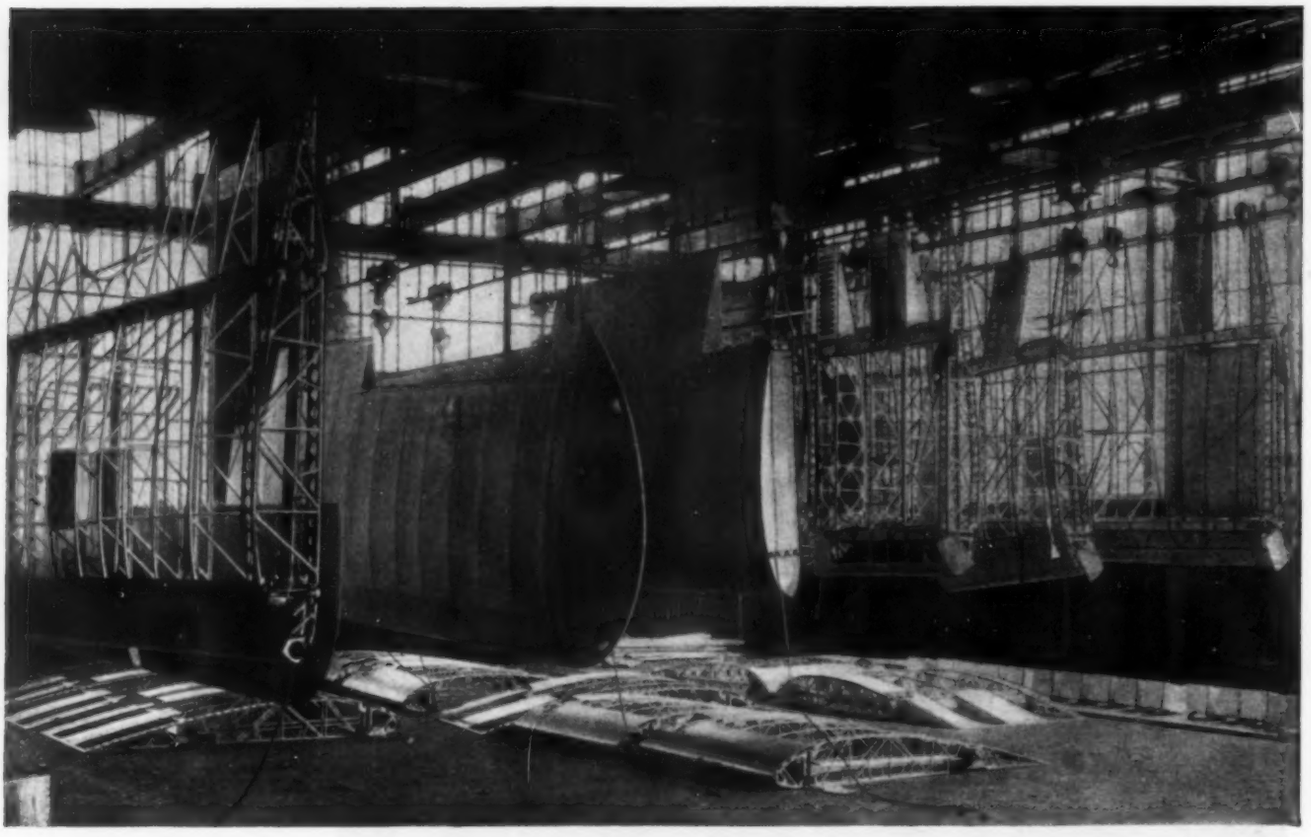


Fig. 8—Covering and storage department showing wing parts waiting for their fabric covering. The symmetry and gracefulness of the design are brought out plainly

justify the use of fixtures and manufacturing methods.

Fastened to the fuselage above the cockpit, by four heavy braces, the wing midship section, Fig. 4, carries the two outer wing sections. The assembly shown is upside down, and shows the four heavy brackets to which the braces fasten, and two of the hinges by which the outer wings section is carried. The fuel and oil tanks will be fully enclosed when the section is covered. This part illustrates the growing tendency to thicken the wing section, and it is seriously stated by competent engineers that the future long distance plane will have its engines at the rear, and its passenger accommodations forward, all inside the wing structure.

The lower wing does not extend under the fuselage, so hinge panels are built into the lower part of the fuselage to carry the hinges for the lower wing sections. The buffers and bearings for the landing gear fasten to these hinge panels and two diagonal braces run from the top to join the braces holding the upper section.

Wings Must Bear Severe Stresses

The wings carry the weight and bear the added strain of air pressure at high speeds. On a straightaway course, or in making altitude this is not serious, but coming down at the rate of two hundred miles an hour and then flattening out to check headway brings a terrific strain on the wings, and their construction must be correspondingly strong. The two main cross beams are box shaped with the usual flanged holes for lightness and rigidity, the fore and aft ribs however are of built up section. In the illustration Fig. 5 the end of the rib is left off, as the aileron, or movable section at the rear of the wing, hinges to the two heavy tubular brackets shown at the first and fourth ribs, from the left.

Both rigidity and strength are evident in the fabrication of the wing tip shown in Fig. 6. It will be noted that the bracing is designed to keep the tip from turning up. The fore and aft strips have not been riveted to their uprights as yet, but Fig. 8 shows how solid this tip looks when complete.

Covering the Frame

With the wing frame complete, there remains but to cover it, and to do so with fabric appears a rather difficult job. It is readily solved, however, by using a sheet aluminum nose cover. This is bent to shape and held by the fixtures shown in Fig. 7, until it is riveted. The fabric-covering can be stretched over this cover without being damaged or mis-shapen. Attention is again drawn to the quantities, and manufacturing methods, evident in this factory.

Covering is done in the department shown in Fig. 8, where a complete equipment of trolley track and chain hoists has been installed. The economy of space compares favorably with that to be found in any other mechanical industry.

While the wings and such parts have been progressing along one production line, the fuselage has been coming along another. The engine has been tested and fastened to its ring at the forward end, the cockpits have been finished and the instruments installed, and the plane is ready for delivery, or test flight, as the case may be.

Fixtures for Production Milling

By Frank W. Curtis
Western Editor, American Machinist

In the production of interchangeable work, the fixtures must be so designed that each part will be held in the same position relative to the cutting tools

A STRADDLE-MILLING fixture for machining an angular flat on the end of a key is illustrated in Fig. 7. It is arranged to hold 36 pieces in pairs, having 18 clamps of the automatic-operating type Details of the clamps are shown at the upper left. A spring tension is used for clamping, the tension being adjusted to suit the pressure of the cut, so that the work cannot work loose when being machined. The clamps are held in place by studs, as shown at *A*, which have rollers located at their inner ends. The rollers engage the camplate *B*, which holds the studs in the clamping position. The camplate is made sectional, so that after the work has passed the cutting position, the rollers on the studs disengage the camplate and release the clamping pressure. The plug *C* is used to aid in the release of the clamp, thus allowing the operator to remove the finished work and replace it with other parts.

As the fixture continues to rotate, re-engagement of the rollers against the camplate causes clamping action to again take place. However, to insure having the work located correctly before being clamped, the ends of the keys strike the spring plate *D*, which forces the opposite ends of the work against the stop ring *E*. Incidently, this ring is interchangeable with seven similar rings, making the fixture suitable for the milling of various sizes of keys.

Operating features of the fixture are shown in Fig. 8. Rotation of the fixture is by a belt drive through the pulley *A*, and the drive shaft *B*, which drives worm gearing *C*. The clutch, shown at *D*, allows disengagement of the drive. It is operated by a lever, located on the operating side of the fixture. A guard is built around the fixture, as shown at *E*, to safeguard the operator against injury. An outline of the cutters as they are positioned when in operation is shown at *H*. Provision for lubrication has been made for the drive shaft bearings, the clutch and the worm gearing.

An automatic type of indexing fixture, for milling nine sets of equally-spaced slots in key frames is illustrated in Figs. 9 and 10, the smaller illustration merely showing how the work is positioned on, and clamped to, the fixture plate. A section of the work is shown at *A* in both illustrations, the inside web sections of the slots being machined to $\frac{3}{16}$ in. in width, and the outer sections to a width of $\frac{1}{8}$ in. The operation is done in a milling machine equipped with two cutters, by advancing the work in one direction to pass under the first cutter, after which the work is reversed to pass under the second cutter. The fixture holds two key frames, one of which is being milled while the other is at the loading position. A frame is milled in $2\frac{1}{4}$ min., floor-to-floor time, which reduces by 50 per cent the former time required to do the same operation with a hand-type indexing fixture. Operating features of the fixture may appear somewhat complicated, but a little study of the design will show its simplicity.

A cycle required to complete a slot is accomplished by moving the entire fixture body longitudinally from neutral to the forward position, then reversing it to the opposite position, after which it is returned to neutral. At this point the table is indexed and the cycle is repeated. The fixture body has a dovetail slide machined in its bottom face, which fits a corresponding surface in the base *B*, Fig. 10. The machine table is locked in place and all motions are obtained by operation of the

Conclusion of the article started last week.

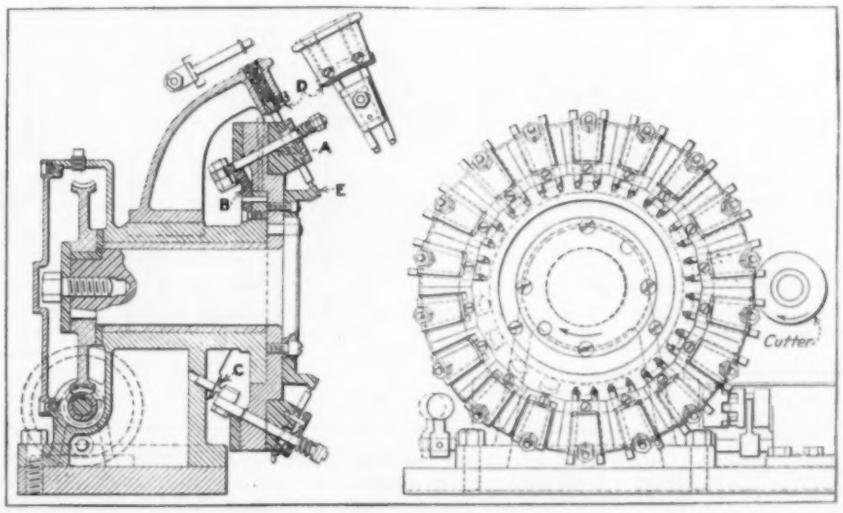


Fig. 7—A vertical, continuous-milling fixture for straddle-milling the ends of a small key. The features of the fixture are that the work is located, clamped, and ejected automatically

The work-holding section is arranged to accommodate 36 pieces and has eighteen clamps arranged to hold two pieces each

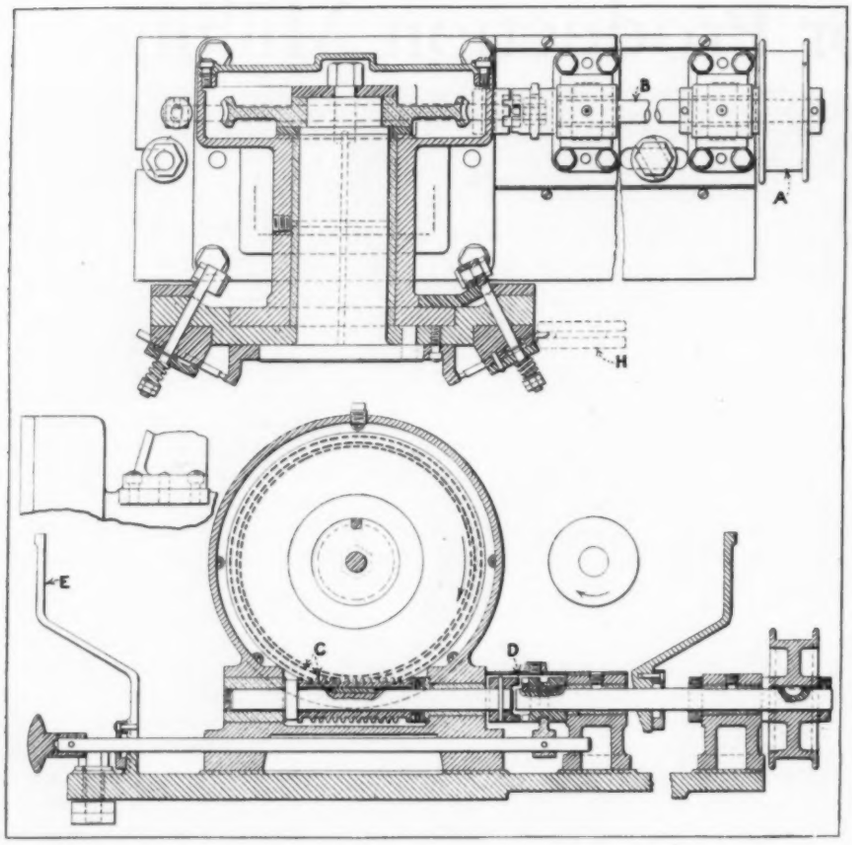


Fig. 8—Operation of the straddle-milling fixture is by means of a belt drive and worm gearing. The drive shaft clutch D permits the fixture to be stopped without stopping the machine

fixture itself actuated by a cam.

Power to operate the fixture comes from the machine-table feed shaft, which is connected at *C*. A toothed clutch which can be engaged and disengaged by a lever is provided to enable the drive of the fixture to be stopped without stopping the machine. On the drive shaft is attached a worm which engages a wormwheel, the ratio being 36 to 1. The drive shaft operates at 144 r.p.m. and the wormwheel at 4 r.p.m. Attached to the wormwheel is the camplate *D*, having a camslot machined at its under face. The roller *E*, fastened to the base of the fixture, engages the camslot, so that the rotation of the camplate causes the fixture body, of which the camplate is a part, to move longitudinally in relation to the cam contour.

The upper portion of the fixture consists of the fixture plate *H*, to which is fastened an indexing plate and a spur gear. This unit is operated by a small face cam and a finger, attached to the upper surface of the camplate. The smaller face cam *J* disengages the indexing pawl *K* by striking the arm *L*. Hand disengagement is by operation of the lever *M*. While the indexing pawl is disengaged, the finger *N* strikes the

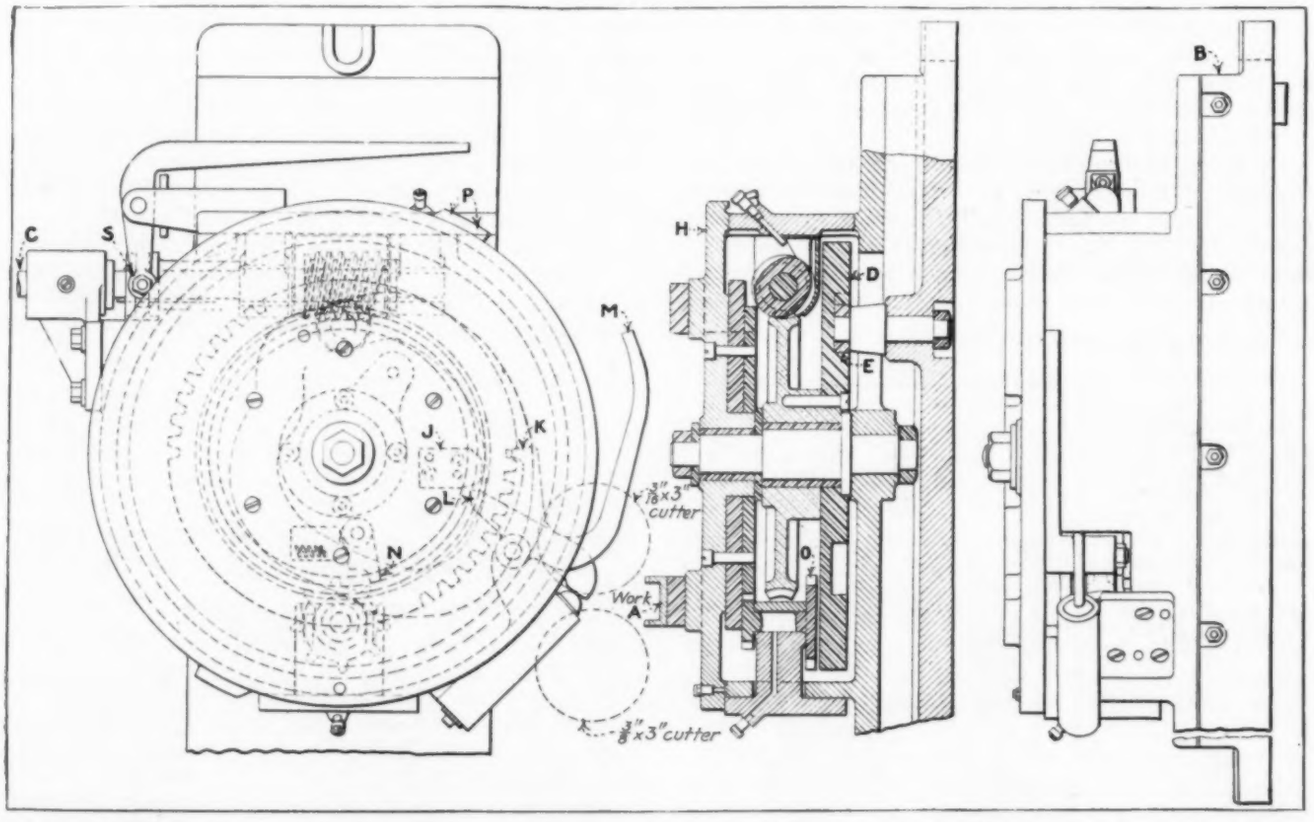


Fig. 10—An automatic indexing fixture arranged with a longitudinal feeding device that operates independently of the machine table. The feed shaft of the machine is used to operate the fixture, and a toothed clutch stops it without stopping the machine. After completing a piece, the fixture disengages automatically

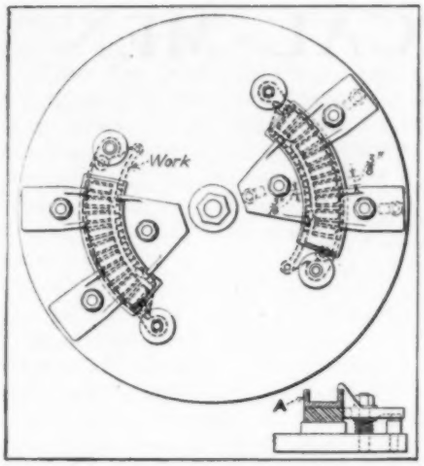


Fig. 9 — Fixture plate used in connection with an automatic indexing fixture for milling nine sets of equally spaced slots. One piece is loaded while the other is being machined. The feed throws out automatically

sprocket *O*, causing it to make one-eighth of a turn. A small spur gear, meshing with a larger spur gear, is integral with the sprocket, so that it turns likewise, causing the upper portion of the fixture to rotate accordingly, the distance being equal to one space on the indexing plate. At this point the pawl, aided by a coil-spring, enters the next space on the indexing plate and the camplate makes another revolution, completing a cycle before another index is made.

After nine slots have been cut, the plate *P*, of which two are attached to the fixture plate, strikes the roller *S*, attached to the clutch lever, throwing out the clutch and disengaging the drive. The operator then turns the fixture plate until the indexing pawl engages the first spacing of the second set of teeth of the indexing plate, causing proper alignment for the milling of the opposite piece of work, after which the clutch is again engaged by hand.

In the construction of the fixture the unit system is followed, since the outer bearing for the drive shaft, the plate that houses the clutch lever and the worm support, the indexing pawl assembly, and the sprocket and spur-gear brackets are made as separate units. This design simplifies construction of the fixture, as well as any repair work that may be required.

The examples of milling fixtures illustrated were obtained through the courtesy of the National Cash Register Company, Dayton, Ohio.

What Age Executives?

By J. W. Pepperdine
Peterborough, England

IT HAS been suggested lately that the directorate of a prominent British railway is not sufficiently youthful —nine are over 70, and the average age is 69. In answer to this statement, which is something we often hear in the shop, it might be said that no man who is wise and progressive has ever done learning, and many of these successful business men, although certainly aged as considered in terms of years, nevertheless are still energetic, progressive, and utilize to a remarkable degree the wealth of experience they have gained through their long and successful careers.

They do not resist an innovation simply because it is an innovation and so put an obstacle in the way of progress. The pressure of competition serves to increase their interest in new ideas and stimulate their desire to use the latest improvements.

If business is lagging behind, and failing to meet competition because of methods which plainly show that the directorate is "in a rut," then early endeavor should be made to revise, to develop, to modernize, and to bring it up to date; but business vitality should be measured, not by age, but by the active mentality of the men in control, and by their ability to carry through the schemes evolved.

SEEN · AND · HEARD

By John R. Godfrey

"Mil" instead of thousandth —New cutting tools

HOW much time do we lose by sticking to the "thousandth" either in talking or writing about dimensions? True, we frequently abbreviate it to "tenths," when occasion permits and the measurement is fine enough. But in the majority of cases we drag out the whole ten-letter word, or eleven, if we put the "s" on the end. And think of the ink we waste in writing it when we fail to use figures.

Years ago the electrical engineers kidnapped the metric prefix "mil" for use in designating electrical wiring. Why not save time by following suit in the shop and appropriate the same prefix for inch measurements? "Milli-inch" means a thousandth of an inch just as much as milli-meter means a thousandth of a meter. And why give our metric friends a monopoly of a convenient handle when the use will save us a lot of time in the shop? Why not say "half a mil" or "seven mils" instead of dragging in the thousandth with its ten letters?

Over in England shop men have abbreviated thousandths for years, calling it a "thou," "half a thou" being very common in pre-war days. I have never heard this used on this side of the pond in spite of the fact that we are more apt to drop letters (as the *u* in gage and labor) and otherwise abbreviate the language, than our friends across the sea. But "thou" isn't as good as "mil," so why not have the best?

* * * *

It is somewhat surprising, in view of the comparative scarcity of the new tungsten carbide cutting alloys, to find so much of it in use, and frequently in small shops, as production shops go in these days. In most cases that have come under obervation, very high cutting speed has not been attempted, possibly because of fear that the machines would not stand the increased strain. Longer tool life between grinds is frequently the only saving over regular high-speed steel, but this is usually sufficient to make the use of the new material well worth while on work for which it is adapted. For the increase in tool life seems to run from 100 to 1,000 to 1, which is well worth considering.

In one shop, however, high speed was being attained, and on intermittent cuts. Aluminum alloy pistons were being turned at approximately 2,000 ft. per min., which is *some* speed. It reminds me of an airplane engine builder during the War, who faced the joint on the aluminum oil pans on a regular buzz planer. I don't recall either the cutting speed or the kind of knives in the cutter head, but it was startling to see an aluminum oil pan shoved over the top of a buzz planer knife just as though it were wood.

IDEAS · FROM · PRACTICAL · MEN

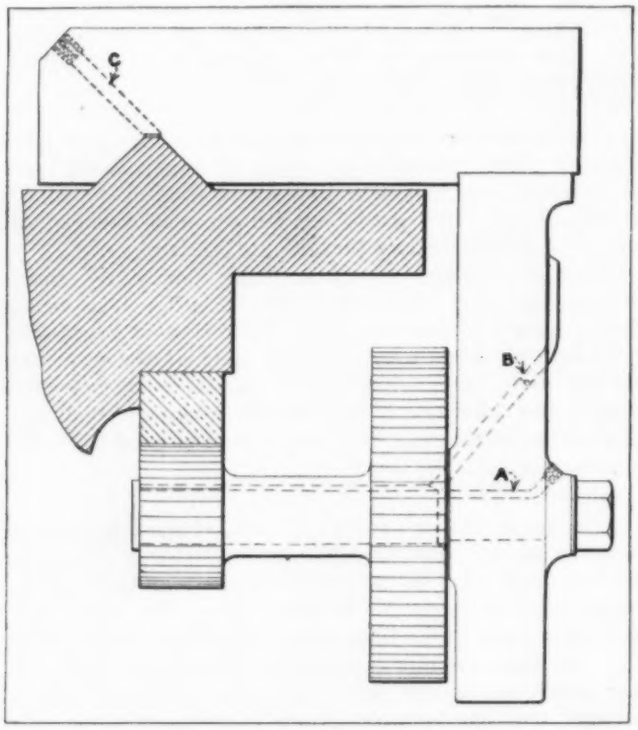
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Better Oiling on Machine Tools

By W. S. Rowell

While recent changes in machine tool design are providing better means of oiling the working parts, there is still room for some improvement. Lathes, for instance, often have an oil hole or two where they are not wanted, and are short several that are badly needed.

The means usually provided to deliver oil to a bearing is at times an equally good method of delivering dirt and grit to the place where it can do the most harm. I had the job of dismantling and repairing the apron of a lathe. The rack pinion was integral with its gear



A better method of oiling two important points on an engine lathe

through a connecting sleeve—a common form. The sleeve and bearings had been rebored because of excessive wear, and a new stud of larger diameter to fit, had replaced the old one.

The original provision for oiling, as shown at *A* in the illustration, was along the stud from an oil hole just above it. The oil with almost no help from gravity was expected to find its way to the opposite end of the stud and the result was naturally a dry bearing surface and rapid wear.

But, when the diameter of the stud was increased, the trouble was aggravated because the new oilway was cut with a step so that in order to reach the pinion bearing the oil would have to rise above its source. This condition was remedied by plugging the original hole and drilling one as shown at *B*. A piece of small copper tube was driven in and bent back against the apron. This provided sufficient head to drive the oil where it was needed. When the apron was again dismantled, recently, it was found that the pinion end of the stud showed no signs of wear; proof that it had been receiving oil.

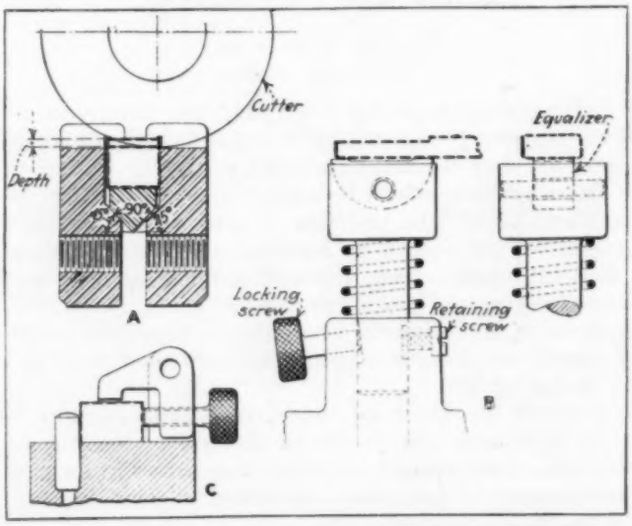
In the ways of a lathe we have important bearing surfaces upon which the machine depends for its accuracy. These ways are exposed to dirt, chips, and grit, and no better provision is made for oiling them than was used on our grandfather's cart axle, and no more protection from dirt and grit is provided.

A lathe carriage should have well designed wipers and a gravity method of oiling. Lubricant delivered from above as shown at *C* would wash the dirt and chips away from the bearing surfaces instead of providing a means of collecting dirt on them.

Three Methods of Holding Work

By C. W. Hinman

At *A* is shown a section through a pair of vise jaws designed for holding a bar while milling transverse slots in the top, the object being to so hold the work that the depth of cut can be accurately measured from the tops of the jaws. The jaws are channeled so as to leave ledges at the tops, while at the bottom of the channels they are machined to an angle of 45 deg. A steel strip having an included angle of 90 deg. on its



Methods of holding work for machining

under side fits loosely between the jaws. The work is laid on top of this strip.

When the jaws are closed, this strip is forced upward, carrying the work against the ledges at their tops. The width of the steel strip and the depth of the channels should be such that the work is held between the strip and the ledges, and does not contact with the channeled part of the jaws. When the jaws are opened a trifle, the steel strip drops and the work can be removed endwise.

An equalizing plunger-support is shown at *B*. In the case of a casting having a thin projection, the projection is supported by the plunger and the pressure is equalized by the semicircular piece pivoted at the top. When the spring plunger is depressed by clamping the main body of the work, the equalizer automatically seats itself and conforms to any irregularity in the work. The locking screw is then brought against the plunger, holding it in position where it forms a rigid support.

A device for holding work in two directions by a single screw is shown at *C*. The device can be adapted for holding work in a variety of jigs and fixtures.

Protecting Aluminum and Its Alloys from Corrosion

By H. J. Huester

A process for protecting aluminum, and its alloys containing up to four per cent copper, is to suspend the parts to be treated in a three-per-cent solution of chromic acid (chromium trioxide, C.P.) contained in a steel tank.

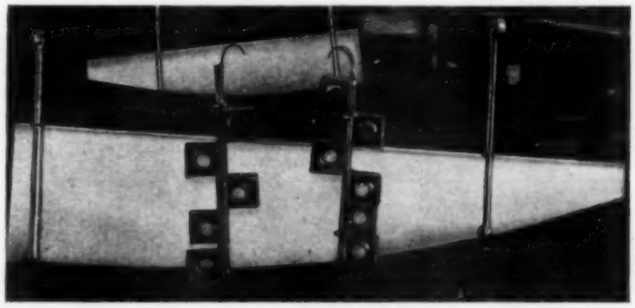


Fig. 1—Device for suspending the work in the solution

The part to be treated is the anode, while the steel tank is the cathode. Oxide, or hydroxide, is formed as a film on the part by gradually raising the current voltage from zero to 40 in the course of fifteen minutes, and holding it at that voltage for 35 min. It is then raised from 40 to 50 volts in the next five minutes and is held at the higher voltage for five minutes.

The amperage should be varied according to the amount of surface to be treated, ordinary wrought material requiring from two to three amperes per square foot. Besides protecting the metal from corrosion, the film makes an excellent base for paints or varnishes, greatly increasing their adherence.

Formerly, the part to be treated was suspended in the electrolyte by means of aluminum wire, because it is necessary to the successful operation of the process that all metal below the surface of the solution be of aluminum or one of its alloys. This method of suspension was not entirely satisfactory because of the large quantity of wire consumed, the labor involved in wiring and the possibility of the formation of an incomplete or otherwise unsatisfactory film, due to poor electrical contact, or from failure of the wire, due to overload. For instance, where two wires are required to suspend a large sheet, one at each end, if one fails, the sheet strikes the bottom of the tank, burning the sheet and blowing a fuse. The wire was used for one operaiton only and was then discarded. The cost of the wire averages about 60 cents per lb., and we used about 35 lb. per month, amounting to $21.00 total cost.

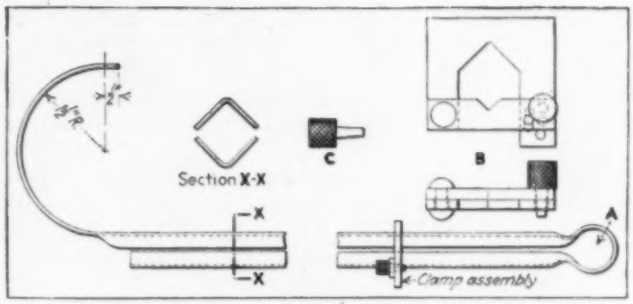


Fig. 2—Details of the suspension device

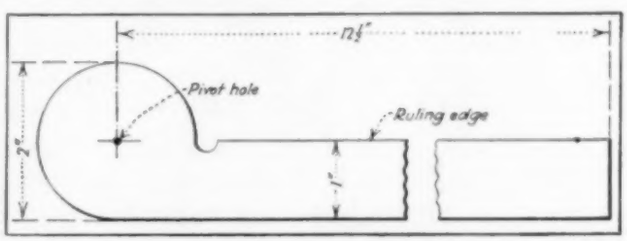
The device shown in Fig. 1 was designed to take the place of the wire for suspending parts in the solution. It is principally of Duralumin angle, and is so designed that it can be used repeatedly, and so that no surface of the work remains untreated. Six of these suspension devices were made in October, 1928, and at present are giving excellent service.

As shown in Fig. 2, the suspension device consists of a Duralumin angle of 14 B. & S. gage, so formed at *A* that the legs come together at *B*, see section *X–X*. The spring effect permits the legs of the angle to remain open while inserting the part to be clamped. The legs are held together by the hand while one or more hinged locking devices, such as the one shown at *B*, are made secure by inserting the pin *C* in the proper hole, which is determined by the gage of the material to be held. One leg is bent over into a hook so that the device can be suspended from the positive terminal. It is necessary to remove the film from the longitudinal edges of the legs after each operation to insure positive contact with the work for the next treatment. This can be done quickly and thoroughly by drawing abrasive cloth or sandpaper along the edges.

A Handy Drafting Accessory

By Francis M. Weston

A useful addition to any draftsman's outfit is the radial straight-edge shown in the illustration. It is preferably made of celluloid, but may be made of sheet brass or aluminum. The pivot hole should be drilled to suit the size of the needle, or pin, that is to be used as a center. The only particular points to be taken care



Straight-edge for inking radial lines

of in making this tool are that the ruling edge must be truly straight and that the pivot hole must be located accurately on the prolongation of a line drawn from the ruling edge. A length of 12½ in. from the pivot hole to the outer end of the ruling edge is a convenient size.

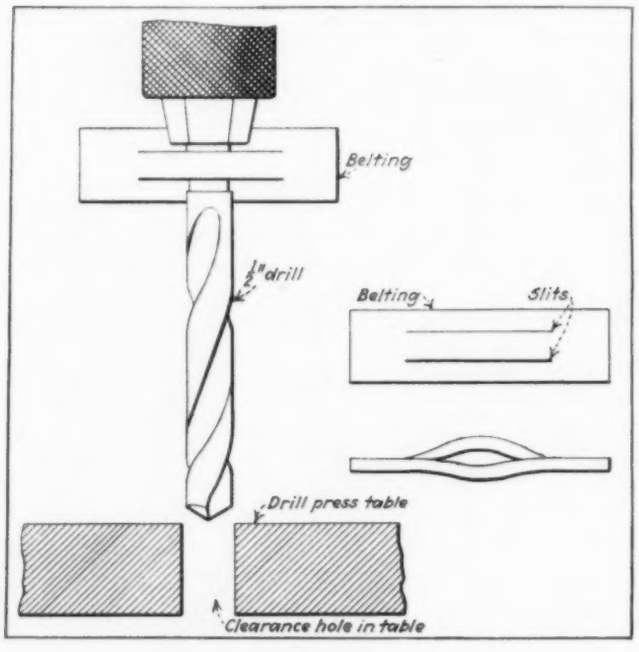
The principal use of this tool is in inking or tracing radial lines drawn at angles other than those to be obtained by use of the regular triangles. The lines are laid off on the original drawing by means of offsets or by a protractor, but the protractor is not of much use for inking, and the use of an ordinary straight-edge set to each individual line makes tedious work.

A Drill Press Wiper

By A. Kendal
Hamilton, Ontario

When drilling a half inch hole in a batch of Bakelite pieces, I used a wiper on the drill to clear away the cuttings, instead of a hand brush. Running at high speed this cleaned a circle by bringing the spindle down until the wiper touched the table.

As shown in the illustration, a couple of slits are cut



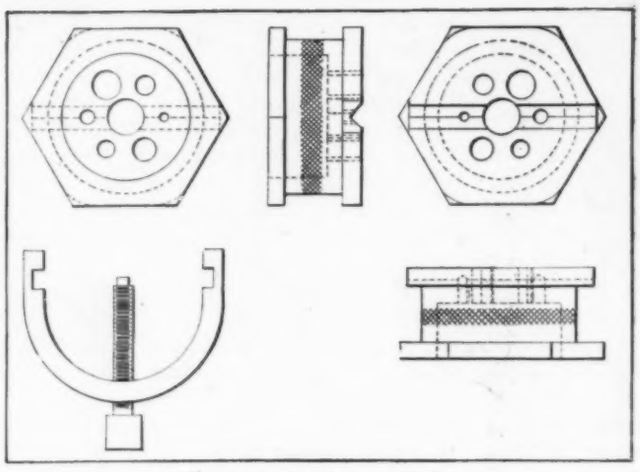
Clearing chips after drilling

in a piece of belting so that it can be slid on the drill. The belting is pushed up a little way beyond the chuck jaws so that these will drive it. The belt might not work as well on metal cuttings, but probably a brush could be made to act in the same way by sawing off the handle, drilling through it, and holding it on the drill by a set screw.

A Handy Bench Block

By E. L. Sleppy

The bench block shown in the illustration has hexagon flanges at the top and bottom. The body between the flanges is round, and the diameter of the round part is less than the distance across the flats of the hexagons.



A convenient bench block

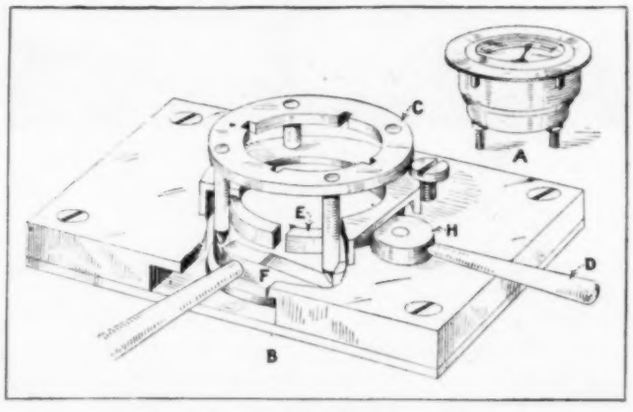
This construction permits the clamp to slide nearly the length of the flats, permitting work to be held so that it can be milled or drilled. The flange at the bottom provides means for clamping the block to the surface of a machine table. The holes in the block allow pins or rivets to be driven through flat or round work laid thereon. The round part of the body is knurled to provide a finger grip in handling and holding.

The block can be made any size or height to suit the work for which it is to be used. Of course, it should be casehardened.

Fixture for Unsealing Ammeters

By Chas. H. Willey

After dash ammeters for automobiles have been assembled, it is often necessary to unseal them by removing the bezel and the glass, and to reset the dial so that the pointer and the zero mark will coincide. Sometimes



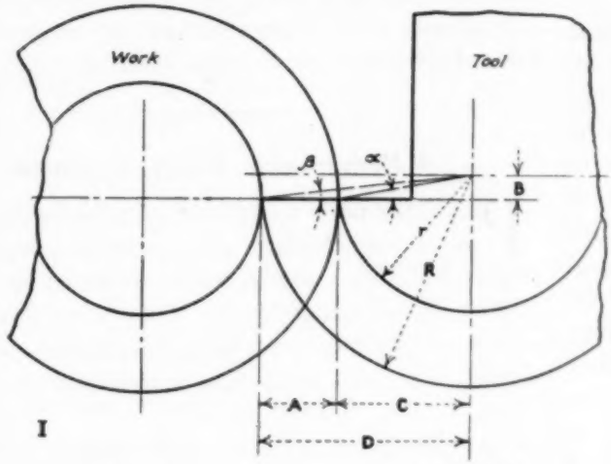
Unsealing fixture for ammeters

the magnet has been placed too far down, in which case the meter must be taken apart and recalibrated.

In the illustration the assembled meter is shown at *A* and the fixture for unsealing it is shown at *B*. The meter is placed in the opening in the plate *C* with a stepped cam *F*, operated by the lever *D*, in such position that the plate *C* will be in its lowest position. A spring ring at *E* is then compressed around the bottom of the case by operating the cam *H*. By rotating the stepped cam *F* to the right, the stripper plate *C* is forced upward, removing the bezel and the glass from the case.

Corrections for Circular Form Tools

Corrections in Diameters of Circular Forming Tools
Cutting Edge on Center of Work



I

Case No. 1
To find small radius r
Given: A = Radial depth of cut on work
B = Distance below center at which tool cuts
R = Tool radius

Calculation:
$\sin\beta = \frac{B}{R}$
$D = \frac{B}{\tan\beta}$
$C = D - A$
$\tan\alpha = \frac{B}{A}$
$r = \frac{B}{\sin\alpha}$

Case No. 2
To find large radius R
Given: A (same as case No. 1)
B " " " "
r = Tool radius

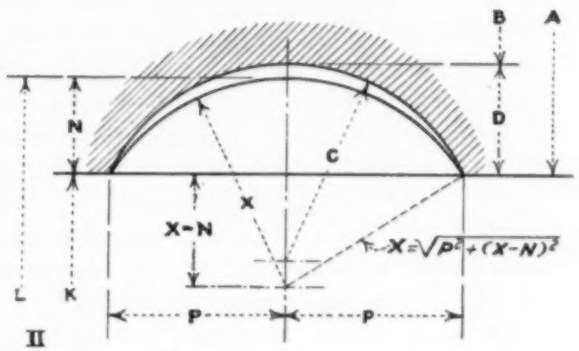
Calculation:
$\sin\alpha = \frac{B}{r}$
$C = \frac{B}{\tan\alpha}$
$D = A + C$
$\tan\beta = \frac{B}{D}$
$R = \frac{B}{\sin\beta}$

Values of D (Chart I) for Tools of Given Diameters

Tool Radius R	Tool Cut Below Center (= B)					
	1/16 In.	1/8 In.	3/16 In.	1/4 In.	5/16 In.	3/8 In.
0.500	0.4961	0.4841	.....	.....	.....	.....
0.625	0.6219	0.6124	.....	.....	.....	.....
0.750	0.7474	0.7395	0.7262	.....	.....	.....
0.875	0.8728	0.8660	0.8547	.....	.....	.....
1.000	0.9980	0.9922	0.9823	.....	.....	.....
1.125	.....	1.1180	1.1103	1.0969	.....	.....
1.250	.....	1.2437	1.2359	1.2248	.....	.....
1.375	.....	1.3693	1.3622	1.3521	.....	.....
1.500	.....	1.4948	1.4882	1.4791	1.4671	.....
1.625	.....	.....	1.6141	1.6056	1.5946	.....
1.750	.....	.....	1.7400	1.7321	1.7219	.....
1.875	.....	.....	1.8656	1.8583	1.8488	1.8371
2.000	.....	.....	1.9912	1.9843	1.9755	1.9645
2.125	.....	.....	.....	2.1102	2.1019	2.0917
2.250	.....	.....	.....	2.2360	2.2282	2.2186
2.375	.....	.....	.....	2.3618	2.3544	2.3458
2.500	.....	.....	.....	2.4874	2.4804	2.4717
2.625	.....	.....	.....	2.6137	2.6063	2.5981
2.750	.....	.....	.....	.....	2.7322	2.7243
2.875	.....	.....	.....	.....	2.8579	2.8505
3.000	.....	.....	.....	.....	2.9837	2.9764

Above values are for D in Case 1 only. For Case 2 substitute r for R and read values as C in the formula.

Corrections in Radii for Forming Tools
Chord of Arc Parallel to Center Line of Product



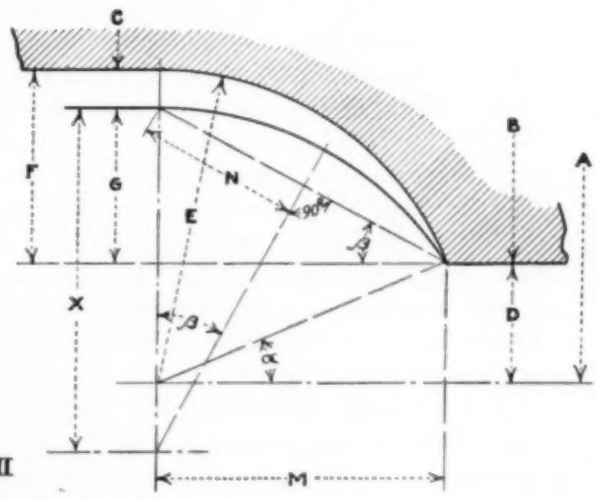
II

Given:
A = Diameter
B = "
C = Radius
D = ½(A-B)
} Product

K = Diameter (corrected)
L = "
N = ½(L-K)
} Tool

$P=\sqrt{C^2-(C-D)^2}$
$X=\frac{P^2+N^2}{2N}$
$X=\frac{C^2-(C-D)^2+N^2}{2N}$

Corrections in Radii for Forming Tools
Chord of Arc at an Angle to Center Line of Product



III

Given:
A = Diam. at center of radius
B = O.D. of product
C = Groove diam. = A-2E
D = ½(A-B)
E = Groove radius
F = ½(B-C)

Solution for dimension G
G = F corrected
G = R-r (Chart I)
as calculated for B and C of this sheet

To find:
Corrected radius X

Calculation:
$\sin\alpha = \frac{D}{E}$
$M = \frac{D}{\tan\alpha}$
$\tan\beta = \frac{G}{M}$
$2N = \frac{M}{\cos\beta}$
$X = \frac{N}{\sin\beta}$

Contributed by Harold D. Scoville

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

New Equipment vs. Expansion

A RECENT survey of industrial plants unearthed the significant but rather disturbing fact that expenditures for plant extensions were nearly four times those for the replacement of worn out or obsolete equipment. Such a condition is significant because it indicates the tendency to expand a plant rather than utilize the present space to the best advantage, and disturbing, because it ties up a large amount of capital and makes for an unnecessarily large overhead expense. If business drops off and leaves a large plant only partly occupied, and part of that with obsolete equipment, the result may well be disaster.

Enlarging the plant appeals to the pride of management. It has an alluring sound in a report to stockholders. It looks well in advertising. But it does not denote real prosperity any more than the use of a five-ton truck to carry a two-ton load.

Increasing production by enlarging the plant is simply following the line of least resistance. It takes a higher type of management to find new machines and methods, to decide when it will pay to discard old machines and buy new, taking what may seem to be a loss in so doing. It also requires more leadership to convince a board of directors that the value of equipment does not depend on its age or condition, but on the productivity of the best equipment now available. It takes nerve to discard machines that still seem to be in good condition, but it is frequently the highest type of management.

Before voting money for plant expansion it is the part of wisdom to make a careful study of the possibilities of increasing the output with more modern equipment.

Itemizing Maintenance Expense

THE maintenance account in many shops makes a convenient dumping ground for a lot of miscellaneous expenses that no one seems to know what to do with. Like charity, it covers a multitude of sins. And, not knowing all the items that go to make up an account, it is very difficult to know where to cut out unnecessary expenses.

Separation of expense items into different groups gives an opportunity to study costs more in detail and to find whether they are excessive or not. Undue belt renewal or chain renewal on certain machines is difficult to locate unless such accounts are itemized and charged direct to the machine.

Bookkeeping is usually one of the least costly operations in any plant, and a few dollars spent in separating costs along the lines mentioned will frequently show expenses that can be greatly reduced once their existence is appreciated.

A Remarkable Tariff Argument

PITY the poor Congressman who has to listen to the arguments of those who seek legislative relief for their troubles with foreign competition! Most of us condemn him freely when his job is done, but we might not be so lavish with our hard words if we had to contend with all that confronts him.

As a brilliant example of the kind of reasoning that drives men to bootleggers, take the argument of the spokesman of the linoleum industry before the Ways and Means Committee. After explaining the advantages of cheaper labor and less expensive raw materials enjoyed by the British manufacturers of linoleum, he made the remarkable statement that they enjoy the further advantage of producing with plant and equipment that is so old that it has been practically depreciated off the books, thereby reducing the overhead charges.

It is axiomatic in the metal-working industry that, other things being equal, the best-equipped plant produces most cheaply and makes the biggest profits. If the linoleum representative's argument is logical his industry operates under a different set of economic laws. The conclusion from his reasoning is that the older the equipment the less the production cost. American manufacturers, therefore, should scrap any expensive, modern equipment they may have and replace it with the cheapest they can get from a dealer in junk.

Tariff legislation is ticklish stuff to handle. What helps one citizen harms another, and what may seem to protect domestic industries is likely to arouse such resentment in those with whom we must do business abroad that the net result is decidedly adverse. There are so many good reasons for a tariff that will protect the American standard of living that it is extremely unfortunate to mix things up by dragging in arguments that are at variance with general experience.

· SHOP · EQUIPMENT · NEWS ·

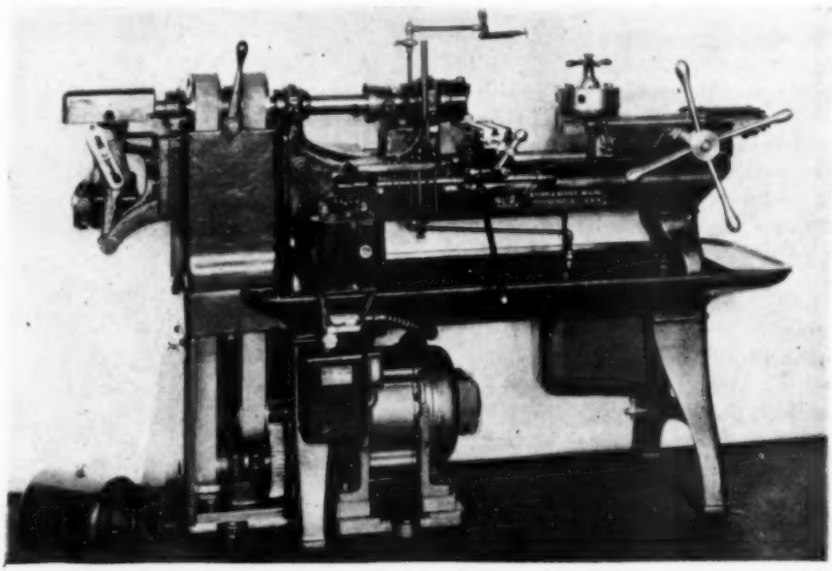
Brown & Sharpe Nos. 0, 1 and 2 Motor-Driven, Wire-Feed Screw Machine

UNUSUAL simplicity of control and flexibility of operation are afforded the producer of small job lots of screws, studs and other turned parts by the Nos. 0, 1 and 2 motor-driven, wire-feed screw machines, according to the Brown & Sharpe Manufacturing Company, Providence, R. I. The machines described herein are of the same capacities as the belt-driven models announced previously.

One of the salient features of the motor-driven machines is the spindle reverse, which is operated by a single lever located conveniently at the left end. Two speeds are available instantly, either being secured by shifting the clutch lever. Thus numerous jobs requiring a tapping operation can be accomplished without interfering with the high speeds of operations performed at faster rates. The tapping operation is done readily since the spindle reverse provides for withdrawing the tap, when threading is completed. When an opening die is being used, the fast- and slow-speed pulleys can be arranged to run in the same direction.

The main driving motor is located under the machine at the left-hand end, where it is protected from chips and dirt, and yet is accessible for oiling and adjustments. It is of the multi-speed type and has four changes of speed, making eight speeds through the spindle reverse.

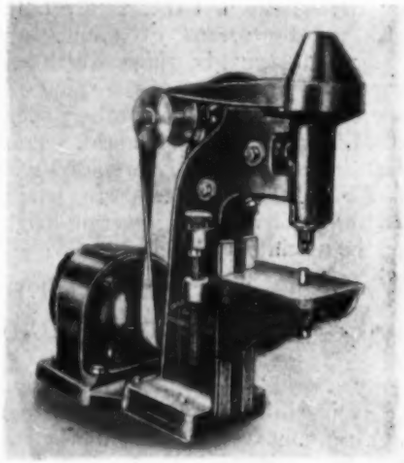
A single pulley is mounted on the motor shaft and drives by belt to the spindle. A gear also mounted on the motor shaft transmits power to a countershaft below. The countershaft in turn drives a second pulley on the spindle. Both pulleys run loose on anti-friction bearings, and are engaged by a friction clutch operated by the spindle reverse lever. Either belt may be crossed in order to reverse the pulley. A small motor at the rear is geared to the driving shaft and provides a constant rate of feed regardless of the spindle speed. The holes through the largest feeding finger are $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{7}{8}$ in. for the Nos. 0, 1 and 2 machines, and the lengths that can be turned are $2\frac{1}{4}$, 3 and 5 inches.



Brown & Sharpe No. 2 Motor-Driven, Wire-Feed Screw Machine

Linley No. 10 Noiseless Rotary Rivet Spinning Machines

Four models of the No. 10 noiseless rotary rivet spinning machine are being manufactured by the Linley Brothers Company, 581 Fairfield Ave., Bridgeport, Conn. The machine illustrated is of the horizontal-motor-driven bench type. The other three models consist of countershaft-driven bench and pedestal types and a horizontal-motor-driven pedestal type. All have capacity for spinning rivets up to $\frac{5}{32}$ in., and, although not recommended for such service, will easily rivet a $\frac{1}{4}$-in. cold-rolled steel rivet with a very slight pedal pressure and without belt slip or machine spring. They were developed to meet the demand for a rigid, powerful and efficient small size noiseless riveting machine. The machine is strongly built throughout to eliminate noise and vibration.



Linley No. 10 Noiseless Rotary Rivet Spinning Machine of the Horizontal-Motor-Driven Bench Type

The $\frac{1}{2}$-in. spindle stroke is operated by a cam and lever system, which, with the short treadle travel, delivers an unusual amount of power throughout the entire movement. The spindle has a $\frac{3}{8}$-in. thread, 24 threads per in., for the attachment of a roll holder. The table is provided with screw adjustment for raising or lowering. Distance from the center of the spindle to the column is 4 in., thus permitting the riveting of large parts and mounting of automatic fixtures on the table. The table drops $5\frac{1}{4}$ in. from the spinning rolls, and it has an area of 4 x $5\frac{1}{2}$ inches.

Idler pulleys with double flanges are equipped with bronze bushings so designed that they will not throw oil regardless of how much oil is fed to them. This feature also applies to the spindle. The spindle pulley is mounted on a large phosphor-bronze

bearing through which the spindle runs. No driving pressure is exerted on the spindle and thrusts are taken care of by means of double-row, radial ball thrust bearings, which also carry the radial load of the spindle at the lower end. The operating speed of 1,500 r.p.m. is standard. Each belt-driven machine is provided with a "Sim-Pull" countershaft having self-oiling bearings. Overall height of the machine is 17¾ inches.

Washburn Accelerating Clutch

By installing the Washburn Accelerating Clutch between a motor and the driven machine, as shown in Fig. 1, the starting torque can be reduced and the machine permitted to start with a uniform acceleration. The clutch has been developed by the Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass. The device relieves both the machine and motor of undue shock and strain, saves costly repairs, and requires a less expensive type of electrical control. For example, where

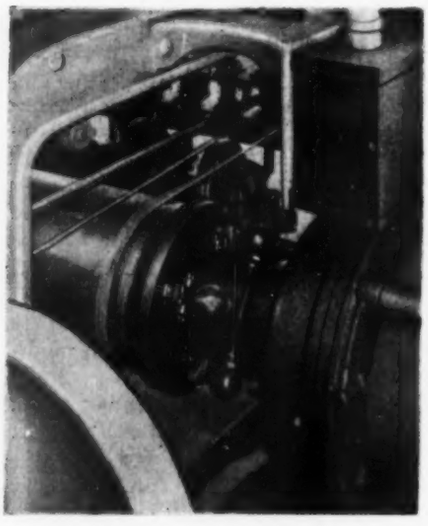


Fig. 1—Example of direct drive by means of the Washburn Accelerating Clutch

the inertia of the machine is very great and consequently it has a very large starting torque, motors even as large as 50 per cent over size are now used. These can be replaced with motors of running load capacity by installing the clutch described, it is stated, thereby saving peak-load conditions at starting as well as making a gain in power factor by the use of more efficient motors.

This clutch is entirely automatic in action, and requires no lubrication nor attention from the operator. It may be mounted as a coupling between the motor and the machine or may be driven by a belt or chain from the motor. It will operate in

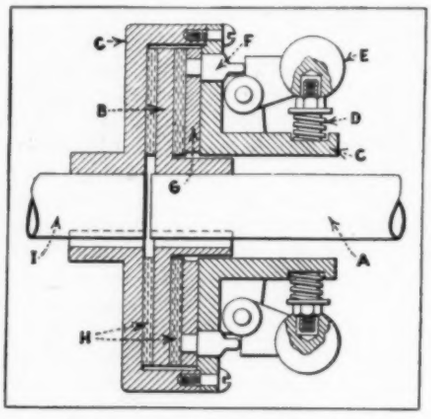


Fig. 2—Cross-section of the Washburn Accelerating Clutch used for direct drive

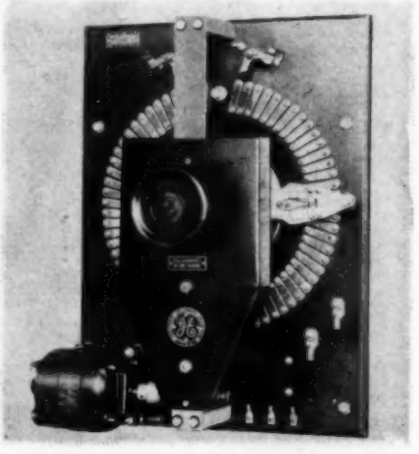
either a horizontal or a vertical position. There is no limit to the size of power which may be transmitted, and it is also applicable to any constant-speed a.c. or d.c. motor. The time of the acceleration varies between 15 to 45 sec. and no friction occurs when running at full speed, thus insuring long life to the friction surfaces.

The principle on which this clutch operates is similar to the ordinary disk clutch except that the cam action instead of being operated by hand, is controlled by centrifugal force which engages automatically. Fig. 2 illustrates a cross-section of a direct drive. To the motor shaft *A* is keyed the disk *B*. When the current is applied to the motor, the only load on the motor is a slight pressure of the frictions *H* on the sides of the disk *B*. This pressure is so slight that the motor comes to speed in two or three seconds, and is controlled by the spring *D* through the bell crank *E* to the pin *F* fastened to the pusher plate *G*. With the motor at full speed and with the slight spring pressure, a slip takes place between the friction *H* and the disk *B*, tending to set the head *C*, which is keyed to the output shaft *I*, in motion. When the head *C* reaches a speed sufficient for centrifugal action to take place in the bell crank *E*, this increases the pressure on the pusher plate *G*, friction *H* and disk *B*, resulting in increasing the speed of the head *C* which, in turn, increases the centrifugal action with resulting increase of speed. This cycle continues until speed of the head *C* is equal to the speed of disk *B*, being the same as the motor speed. The friction disk *B* is fast to the driving shaft.

This principle permits a very wide range in design for different purposes. The weights can be designed to apply sufficient force to make the clutch practically a solid coupling at full speed, or if desired they may be of a weight that will disconnect the clutch entirely at any desired percentage of overload and allow the motor to run freely.

General Electric Radial Switches for Field Rheostats

A complete line of radial rheostat switches, for varying the fields of large generators and motors, is announced by the General Electric Company, Schenectady, N. Y. The switches are for general application where the current is more than 50 amp. and not over 300 amp. There are five forms, for hand, sprocket, gear, solenoid and motor operation. These bear the designations CR-8090, CR-8190, CR-8290, CR-8390 and CR-8490, respectively. The outstanding advantage of these switches is the fact that they have renewable segments. By removing two screws any



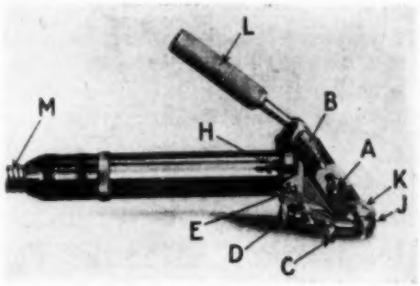
General Electric Motor-Operated Radial Rheostat Switch for controlling the fields of large motors or generators

segment may be taken off without disturbing the resistor leads. The segments may be reversed for increased service.

The switch designed for 100-amp. service has 65 divisions; the 200-amp. switch has 48 divisions, and the 300-amp. switch has 40 divisions. All switches of a given current rating have the same number of divisions, irrespective of how they are operated. Thus, if the user wishes to change from a sprocket-operated switch to a solenoid- or motor-operated one, he can exchange the switches and reconnect the leads. For the smaller hand- or sprocket-operated devices, a 50-division switch, similar to the 65-division form, is available.

"Ideal" 1929 Model Commutator Mica Undercutter

The 1929 Model commutator mica undercutter, announced by the Ideal Commutator Dresser Company, Sycamore, Ill., can be operated in a space 3½ in. wide. It is understood that when this device is used, no time need be spent in dismantling brushes, brush boxes, or brush rigging. The saving of time effected, therefore, may vary between one and three hours on any job. Other advantages claimed for



"Ideal" 1929 Model Commutator Mica Undercutter

the device are that it will not heat, jump, or chatter.

Referring to the illustration, *A* is a setscrew locking the adjustable depth gage and *B* is a micrometer adjusting screw for raising and lowering the depth gage. Micrometer adjusting screw *C* is used for setting the roller guide the proper distance from the cutter. The distance from the saw *K* to the roller guide *J* can be adjusted to the width of the average small copper bar, thus permitting the guide to be used when cutting the second slot after cutting the first by hand. Setscrew *D* is used for locking the roller guide, and setscrew *E* permits the entire roller guide assembly to be rotated so as to permit easy replacement of the cutters. Another micrometer adjusting screw *H* raises or lowers the roller guide to conform to the diameter of the cutter used. Two locknuts hold the cutter *K* in place, one locknut being placed on each side.

Right next to the saw is a depth gage placed so that the actual depth can be measured instantly. It is made with wide surfaces so that, when resting on the commutator, it will not mar the copper, but give a proper bearing. An extra swivel handle *L* is provided for convenience in holding. This can be set at any position by means of a locknut. Power is received through the flexible shaft *M*, which is direct connected to the motor.

Weldit Styles C and G "Gasavers"

Not only is it possible to conserve welding gas but with the Style C and G "Gasavers" a saving may be effected in the time that is usually required to adjust the torch flame, when the work is temporarily held up. The devices have been placed on the market by the Weldit Acetylene Company, Detroit, Mich. In welding, it is frequently necessary to lay aside the torch when new work is being set, jigs turned, or rods secured. When the torch is hung on the arm projecting from the Gasaver, the flame is extinguished immediately and the gas flow stopped. By lifting the torch from the arm and passing it over the handy pilot light at the top of the Gasaver, it is

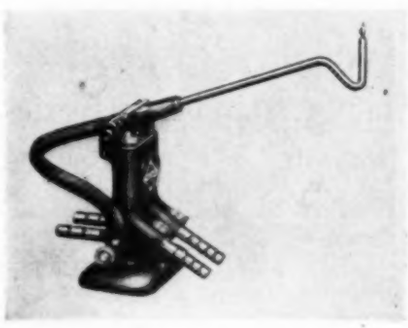


Fig. 1—Weldit Style C "Gasaver" suitable for use with light-weight welding and lead-burning torches

Fig. 2—Weldit Style G "Gasaver" provided with extra large opening valves for city gas or compressed air

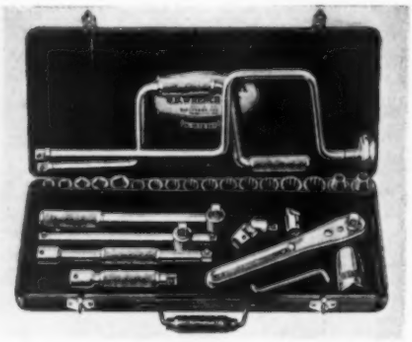
lighted instantly, the same flame as originally adjusted being secured. In addition, these accessories act to prevent accidents, since the lighted torch cannot swing from the hook and ignite clothing or burn the workman.

The Gasaver is placed between the regulators and the feed lines of the cutting or welding torch. Both gases are passed through the device, control of which is governed by its projecting arm acting on two positive-seating spring valves. The adjustment of these valves can be made readily by two small setscrews directly over each plunger. When the torch is held on the arm the weight closes both valves instantly, thereby stopping the flow of both gases. The style C Gasaver was designed especially for light welding and lead burning torches, using illuminating gas and oxygen or compressed air. Style G, for use with acetylene and hydrogen or illuminating gas and oxygen, is provided with extra large openings in the valves for heavy-duty work.

"Chief" Socket-Wrench Sets

Three sets of socket wrenches packed in metal cases have been announced by the Blackhawk Manufacturing Company, Milwaukee, Wis. These sets have the following features: double hexagon sockets that are quickly detachable or may be locked on, chrome-vanadium steel, chromium plating, and metal cases finished in a two-tone crackle finish. They are an addition to the line manufactured by the above company and do not replace present sets or tools in the regular black-enamel finish.

Set 30 CD illustrated contains thirty handles, attachments and sockets. The No. 16 CD contains

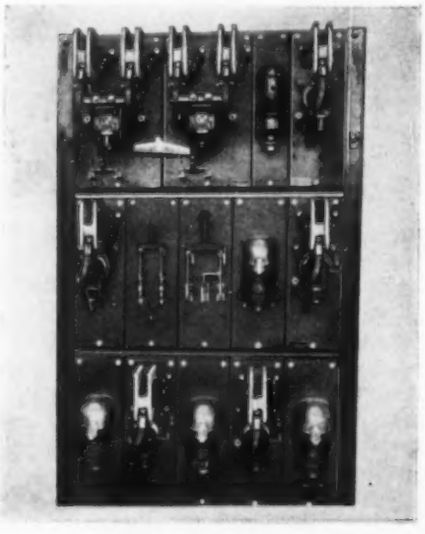


"Chief" No. 30 CD Socket-Wrench Set

sixteen tools and the No. 26 KD combines the 16 CD and ten Blackhawk-Armstrong open end wrenches. Six of these wrenches are of the engineer's pattern, while the remainder are tappet wrenches.

E. C. & M. Time-Current Acceleration Relay

An acceleration relay operating on a new principle and having certain unusual characteristics has been placed on the market by the Electric Controller & Manufacturing Company, 2700 East 79th St., Cleveland, Ohio. The manufacturer states that the time-current acceleration relay has the advantages of the usual systems of acceleration, and that on light loads such as screw downs, mill tables, and other drives, where fast operation is necessary for increased production, the time-current control gives maximum output. On heavy loads accelerations up to 2 sec. per step can be had automatically without any change in adjustment. On normal loads, the forced acceleration increases the torque gradually until the motor starts. A complete line of shunt contactors and a plugging relay as well as the time-current acceleration relay are embodied in the time-current acceleration control illustrated.



E. C. & M. Time-Current Control Panel

Hisey-Wolf Exhauster Equipment for Grinding Wheels

A ball-bearing, motor-driven type of exhauster equipment can be supplied by the Hisey-Wolf Machine Company, Cincinnati, Ohio, for use with Hisey grinders of 10-, 12-, and 14-in. wheel capacity. This equipment can also be supplied for the company's buffing and polishing machines of 8-, 10-, 12-, and 14-in. wheel capacity. The automatic motor starter controls both the exhauster driving motor and the grinding-wheel driving motor simultaneously.

Hisey-Wolf Exhauster Equipment for Grinding Wheels

Millers Falls Electric Hammers and Accessories

That only one moving part is used is the chief feature of the line of electric hammers, which has been announced by the Millers Falls Company, Millers Falls, Mass. The device is designed so simply that no motor or gears are used. At present four distinct sizes are manufactured in capacities to drill $\frac{5}{8}$-, $1\frac{1}{8}$-, $1\frac{1}{2}$-, and 2-in. holes in concrete, respectively. Several models of each are supplied for the usual voltages and frequencies.

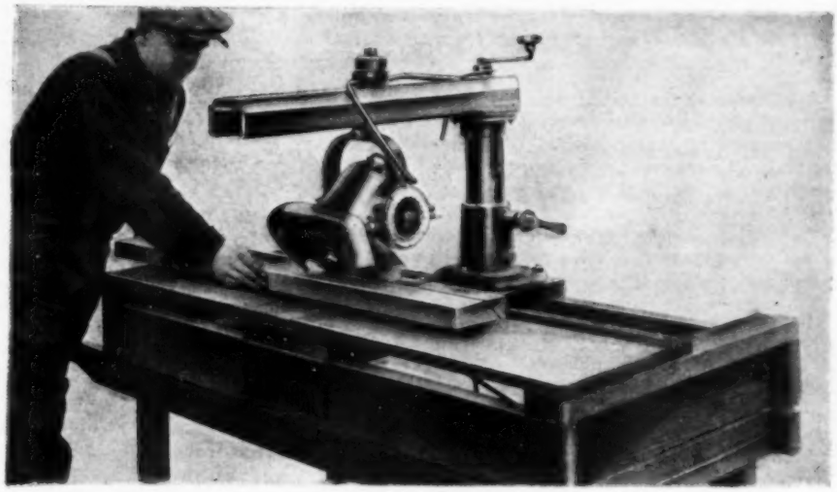
Millers Falls Electric Hammer No. 1816 having capacity to drill a $1\frac{1}{8}$-in. hole in concrete at the rate of $2\frac{1}{2}$ in. per minute

Windings inside the body of the tool form powerful magnets when energized by alternating current. These draw the piston in the center cylinder back and forth at the rate of 3,600 blows per min. when the device is operated from a 60-cycle circuit. The shock-absorbing device at the back of the hammer increases the force of the downstrokes. It is claimed by the manufacturer that many years of hard use will not affect the tool's efficiency nor necessitate replacements. Length of the stroke is $\frac{3}{8}$ in. and power consumption for smallest size is $\frac{1}{8}$ kw. In addition to these various hammer tools, rotary converters and transformers for operating these hammers can be supplied.

Each hammer is furnished with a 40 ft. of extension cord, drill chuck, and drift pin and case. The weight of the smallest and next largest sizes are 9 and 20 lb., respectively. The diameters are $3\frac{1}{4}$ and 4 in., and the lengths are 10 and 14 in., respectively.

De Walt Junior "Wonder Worker" Electric Woodworking Machine

A smaller model of the "Wonder Worker" woodworking machine, known as the "Junior," has been placed on the market by the De Walt Products Corporation, Leola, Pa. The machine illustrated will rip 2-in. stock at the rate of 20 ft. per min., when equipped with a 12-in. combination cross-cut and rip saw, which is standard equipment. Among the 29 distinct cutting operations listed by the manufacturer, as standard for the machine, are dadoing, routing, mitering, shaping, mortising and tenoning. The features include easy adjustment to any position, ability to



De Walt Junior "Wonder Worker" Woodworking Machine mounted upon a portable table

change from cross-cutting to ripping without stopping the motor, and an accurate ripping gage and dials for adjustment to any position. The unit is driven by a universal motor, which can be supplied for all usual voltages and frequencies.

As shown in the illustration, this woodworking machine is fitted onto a wooden table 29 in. wide by 59 in. long. All the work is handled from one side of the table so that the cross-cutting, ripping, shaping and layout marks are always in plain view. This combination of table and machine is compact, readily portable, and can be carried by two men. It weighs 235 lb. complete. Standard equipment includes an adjustable guard that fits down on the work and gives positive protection to the operator.

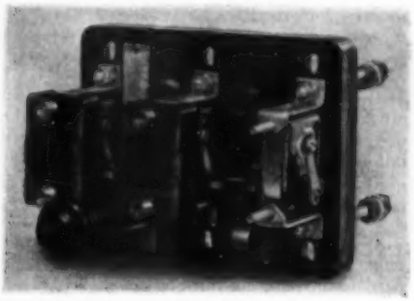
General Electric TC-121 and TC-131 Temperature Overload Relays

A complete line of double- and triple-pole temperature overload relays is offered by the General Electric Company, Schenectady, N. Y. The principal advantage of the line is in the construction, which allows the user to remove and insert heating elements when necessary, and which allows the use of a third relay unit on the same base, when it is desired to protect three legs of a circuit.

The line is divided into two parts, bearing the designations TC-121 and TC-131. The TC-121 relays are designed for the protection of two legs of a circuit, while the TC-131 provides an element for the protection of a third leg. Both forms are rated in current-carrying capacity from 30 to 150 amp., and are available for either front or back connections.

The back-connected forms are for panel mounting, but use the same base as the front-connected forms. On inclosed panels, air drafts are eliminated by the case, but on open panels it is necessary to use a cover over the relay.

An electric reset is provided as an accessory. When used with a relay, which is mounted at the bottom of a base, a sub-base is added. The sub-base is clamped to the main base by the relay itself. Where there is sufficient space, the reset relay can be mounted on the panel itself.



General Electric Temperature Overload Relay

: REVIEW : OF : RECENT : PATENTS :

Relating to the Machinery and Metal Products Industries

Metal-Working Machinery

Two separate patents on dieheads were assigned to the Landis Machine Company. The first of these, 1,699,373, covered a head having a flanged shank containing a ring fastened to the front end of the flange and inclosing an adjustable body, which contains the mechanism. The second patent, 1,699,994 has 18 claims, and is for a head having adjustable tangential chasers on blocks mounted on the body, and clamps on the blocks for holding the chasers in adjusted position. This head also has an adjustable ring for opening and closing the head.

The Fellows Gear Shaper Company was assigned a patent, 1,698,882, on a method of generating accurately-finished gears. It consists in grinding the gear teeth to an approximate of the master form, testing with a testing instrument, and then adjusting the grinding means to reduce the difference.

A boring machine patent, 1,698,971, was granted to James C. Smith, of Cincinnati. The machine has an adjusting screw in a long nut in the rear of the base to adjust up and down movement of the ram and frame. The motor and spindle driving mechanism are mounted on the adjustable frame.

A patent on a rivet-setting machine, 1,698,922, was assigned to the Judson L. Thomson Manufacturing Company. The machine comprises a rivet carrier, a driver, and an anvil. The rivet is clinched by a power-driven driver, manually-controlled.

An automatic heat-treating apparatus was patented, 1,698,824, and assigned to the Westinghouse Lamp Company. The apparatus supports the metal to be heat-treated by gripping and releasing it automatically at any predetermined point.

A saw-tooth grinding machine was patented by Alfred M. Currier, Aberdeen, Wash. The patent 1,698,909, covered a machine having a bracket pivoted on a frame and moving laterally by means of a motor. The grinding wheel is carried on a shaft in the bracket, and the shaft is reciprocated vertically by a worm and gear in the bracket.

Parts and Mechanisms

A patent 1,698,720, was granted to E. P. du Pont, on a speed-reduction gear, which comprised shafts turning eccentrics, a pinion turning with one shaft and an internal gear with the other

shaft, and an intermediate rotary member on the eccentrics.

A screw spike patent, 1,698,951, was granted to Edward C. Holmes, of Cincinnati. It consists of a spirally-fluted threaded shank, the two flutes and the cutting points being similar to those of a drill.

An apparatus for spraying paint or other coating material was patented, 1,698,945, and assigned to the International Engineering Corporation. The nozzle valve and air valve are in the front of the gun, but are operated by a trigger convenient to the handle.

A ball-bearing patent, 1,699,325, assigned to the Pyle-National Company covered a pair of annular rings with the balls retained between blocks, which contain bushings through which the holding clamps pass.

A mounting for roller bearings was patented, 1,699,330 and assigned to the Link-Belt Company. It consists of two sets of tapered rollers running on opposed annular rings and having the races held in by threaded sleeves capable of easy adjustment.

A novel form of ball bearing, in which the races are made in sections and make possible the reduction of the size of the race, was patented, 1,699,450, by William H. Rhoda, of Lakeland, Fla. Another roller bearing, also of novel design, was patented, 1,699,233, by John W. Foley, of Chicago. It consists of a number of series of rollers concentric to one another, but each series being independent of one another. The rollers are inclosed in a suitable casing.

Materials

Three separate patents were issued, 1,698,934; 1,698,935 and 1,698,936, covering high-speed alloys and assigned to the Chesterfield Metal Company. The second of these patents specifies an alloy containing from 15 to 50 per cent of cobalt, 7 to 30 per cent of nickel, 20 to 45 per cent of chromium and 7 to 35 per cent of molydenum, with a small amount of carbon. The third patent specifies the same quantities of cobalt, nickel and chromium, and designates 4 to 30 per cent of a metal not of the chromium group capable of forming a hard carbide with a small amount of carbon. The alloys are for use in cutting tools.

A silver solder was patented, 1,699,761, and assigned to the Westinghouse Electric & Manufacturing Company. It contains 0.25 to 5 per cent of silver and the remainder an alloy of lead and copper, the latter metal in the proportion of 0.25 to 10 per cent of the combined lead and silver content.

Another solder, in the form of a stick, was patented, 1,699,438, by Herman A. Meinhardt, Bad Godesberg, Germany. It consists of an outer casing of soldering metal, a core of soldering metal, and a fluxing agent carried by the core, the core having a higher fusing point than the casing.

A patent on a method of welding sheet iron by means of aluminum, 1,699,434, was granted to Franz Jordan, Wickede-am-Ruhr, Germany. The facing sheets are plated with aluminum and then electrically welded, the aluminum being converted to aluminum oxide which combines with the molten iron at the weld and unites the parts.

The Bakelite Corporation was assigned a patent, 1,699,727, on a process for the production of a phenol condensation product for molding parts. It consists in incorporating a methylene in a phenol-methylene resin mixture, thus producing a composition capable of being transformed by heat into an infusible product.

A patent on a lubricating grease, 1,699,961, was assigned to the Pierce Petroleum Corporation. The grease consists of approximately 73.5 per cent by weight of mineral oil, 5 per cent of heavy tar, and small amounts of calcium and sodium animal soaps.

The Westinghouse Electric & Manufacturing Company was assigned a patent, 1,699,779, on a process for improving the tensile strength of fabric materials. It consists in exposing the material to ozonized air at an elevated temperature.

A brake lining was patented, 1,700,037, and assigned to the Asbestos Manufacturing Company. The patent covers a method of twisting yards of asbestos fiber, forming into cords including wire strands, treating with silicate of soda solution, and then weaving the treated cords into a basket-weave fabric. One side of this fabric is next coated with rubber and a friction material and the whole is subjected to heat and pressure to form a homogenous mass.

Trade Publications

AIR COMPRESSORS. The Pennsylvania Pump & Compressor Co., Easton, Pa., has published Bulletin No. 144 describing duplex air compressors of the direct-connected, motor- and belt-driven types. Views of the various important assemblies and parts are given together with descriptions thereof. A table of sizes is appended together with several views showing these compressors set up in service. The catalog contains sixteen 11x8½-in. pages.

AUTOMATIC STARTERS. The Monitor Controller Co., Baltimore, Md., has published Bulletin No. 113 on its a.c. automatic starters. In the catalog is given a complete description of the construction and operation of these starters together with circuit diagrams and dimension sketches. The catalog contains eight 11x8½-in. pages.

"CROMOVAN" TRIPLE DIE STEEL. The Firth-Sterling Steel Co., McKeesport, Pa., has published a booklet on "Cromovan" Triple Die Steel for which patents have been granted recently. The steel is a new type of high-production die steel and has the feature that dimensional changes due to heat-treating are almost negligible. The catalog shows various types of dies and the parts produced. Various data on heat-treatment are included.

LUBRICATING DEVICES. The Gits Brothers Manufacturing Co., 1940 S. Kilbourn Ave., Chicago, Ill., has published Catalog No. 23 showing 372 styles and sizes of oil cups and lubricating devices for every purpose. The catalog contains full-size illustrations, sectional drawings, details of construction, all dimensions, and full information. The company's high-pressure grease gun and fittings are also illustrated. The catalog contains 68, 11x8½-in. pages.

NICKEL-CAST-IRON FORMULAS. The International Nickel Co., 67 Wall St., New York, N. Y., has published a bulletin entitled "Twelve Practical Foundry Mixtures." It is said that the addition of nickel to cast iron increases the strength, wear resistance, machinability, and toughness.

NICKEL USES IN AIRCRAFT ENGINES. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has published a booklet on the Curtiss "D-12" and the "Conqueror" engines and their use of nickel alloy steel. Performance characteristics and important features of design of these recently developed water-cooled airplane engines are given, including essential specifications and discussion of materials used in their construction. The catalog contains twelve 11x8½-in. pages.

SPEED REDUCERS. Gears and Forgings, Inc., Cleveland, Ohio, has published two catalogs on its speed reducers. Bulletin B takes up in detail the construction and range of uses of the planetary speed reducers, while Bulletin C does likewise with the worm gear speed reducers. Constructional details, tables of specifications, sizes, and directions for mounting are included in each catalog.

STEEL CASTINGS. The Geo. H. Smith Steel Casting Co., Clinton St., Greenfield Ave, and Barclay St., Milwaukee, Wis., is sending out its new catalog entitled "The Story of Smithco Castings." Views are shown of the various departments in the plant and of the methods of manufacture. The castings produced are made entirely from electric steel. The catalog contains fifteen 11x8½-in. pages.

News of the Week

Production Executives to Meet in Pittsburgh

Several leaders in the metal-working industry will present papers or join in the discussions during the program of the Production Executives' Conference to be held at the Webster Hall Hotel, Pittsburgh, February 27 and 28, and March 1. The conference is being sponsored by the Production Executives' Division of the American Management Association, OSCAR GROTHE, vice-president-in-charge, with the co-operation of the Management Division of the American Society of Mechanical Engineers, W. L. CONRAD, chairman. The subject to be considered is: Factory and Operating Organization: Specialists, Their Functions, Activities and Relationships With the Line Organization and With Each Other. Abridged titles and the authors are listed below:

Wednesday Morning, Feb. 27, 10:00 A.M.

Theories and Types of Organization, THOMAS R. JONES, Cincinnati Milling Machine Co.

Discussion by:

LEWIS C. SORRELL, professor of transportation, University of Chicago.

H. B. BERGEN, manager, personnel department, Henry L. Doherty & Co.

JEROME C. WHITE, planning engineer, Pittsburgh Coal Co.

Wednesday Afternoon

Functions and Activities of Research and Development Departments.

Papers by:

C. S. READING, vice-president in charge of engineering and development, Leeds & Northrup Co.

C. W. HIPPLE, works manager, Westinghouse Electric & Manufacturing Co.

Wednesday Evening

Dinner Meeting.

Selection and Training of Recent College Graduates. A round table discussion conducted by the Industrial Training Group of the Association, W. M. NELSON, assistant director of industrial relations, Schenectady Works, General Electric Co., chairman.

Thursday Morning, Feb. 28, 9:30 A.M.

Maintenance, Mechanical and Repair Departments, J. D. ANDREW, general consulting engineer, Engineering Division, Armour & Co.

Discussion by:

EDWARD R. COLE, superintendent, Acheson Graphite Co.

L. C. EDGAR, chief engineer, Edgar Thompson Works, Carnegie Steel Co.

Who Should Control Inventory? H. L. MAXWELL, assistant auditor and office manager, Whitehead & Hoag Co.

Luncheon Meeting, Feb. 28, 12:30 P.M.

Are Indirect Costs Eating Up the Savings in Direct Costs and How Can a Ratio Between Them Be Maintained? T. G. GRAHAM, first vice-president, B. F. Goodrich Company.

Thursday Afternoon, Feb. 28, 2:00 P.M.

Functions and Relationships of Accounting Departments, FRANK L. SWEETSER, general manager and treasurer, Dutchess Manufacturing Co., and president, National Association of Cost Accountants.

Discussion by:

A. L. WANNER, comptroller, Belden Manufacturing Co.

Friday Morning, March 1, 9:30 A.M.

Planning and Production Control Departments, GEORGE RAMAKER, production department, Michaels-Stern Co.

Discussion by:

PAUL C. KRESS, vice-president, F. J. Kress Box Co.

C. A. SIPE, industrial engineer, Jones and Laughlin Steel Corporation.

Time Study, Motion Study, Rate Setting Departments: Their Activities, Functions and Relationships with Line Organization and Other Departments, A. L. KRESS, head, central planning department, United States Rubber Co.

Discussion by:

PROF. JOHN D. HALLOCK, head, Industrial Engineering Department, University of Pittsburgh.

Luncheon Meeting, 12:30 P.M.

Salary versus Extra Incentives for Staff Men, OSCAR GROTHE, vice-president, White Sewing Machine Co., and vice-president-in-charge, Production Executives' Division, American Management Association.

Friday Afternoon, March 1, 2:00 P.M.

The Place of the Consultant in Industrial Organizations, WALTER N. POLAKOV, president, Walter N. Polakov and Co.

Discussion by:

F. RICHMOND FLETCHER, partner, Scovell, Wellington & Co.

The Operating Executives: His Relations to the Specialized Departments, ELIOTT DUNLAP SMITH, professor of industrial engineering, Sheffield Scientific School, Yale University.

Machinery Trade Groups Plan Federation

Sentiment in favor of a permanent organization crystallized sufficiently at the third meeting of executives, directors, and secretaries of the principal trade associations in the machinery field to bring the appointment of a committee to present a plan for such a federation. After sitting all day February 14th in the Washington home of the Chamber of Commerce of the United States under the chairmanship of Ernest F. DuBrul, manager of the National Machine Tool Builders' Association, the delegates concluded that the various committees they had authorized would have more authority if they functioned as representatives of a duly constituted body.

These committees were authorized for the respective purposes of securing for exhibitors at shows run by trade associations or technical societies the free return freight privilege enjoyed by exhibitors at county fairs; of studying tariff schedules and asking for better classifications for machinery imports; of studying existing statistics with the purpose of co-ordinating and simplifying them, or of amplifying where necessary.

In almost all of the discussion the thing that stood out was the crying need for joint effort in solving the problems common to all builders of machinery. Machinery gets the small end of the appropriation in the Bureau of Foreign and Domestic Commerce because it has never insisted on getting its proper share. The tariff protection it has had has not been all it should be, for the same reason.

The topics formally discussed were arbitration, free engineering service, trade-ins, uneconomic trade practices, trade practice conferences, analysis of efforts to eliminate unfair practices, and obsolescence. The discussion leaders were W. W. Nichols, Machinery Builders' Society; V. E. Minich, American Foundry Equipment Co.; E. P. Essley, Associated Machinery Dealers of Chicago; Col. Williams, Associated General Contractors; F. A. Collinge, Association of Manufacturers of Woodworking Machinery; Erik Oberg, *Machinery*, and K. H. Condit, *American Machinist*.

Plans Developing for Engineering Congress

Promising to rank above all preceding engineering congresses ever held, because of the remarkably wide scope of subjects covered and the vital influence it is likely to bear upon the present aspects of international engineering, the World Engineering Congress is to be formally opened on Monday, October 29, 1929, at Tokyo, Japan. The Congress is to be held under the auspices of the Kogakki (The Engineering Society of Japan; a federation of twelve technical societies) with the support of the Imperial Japanese Government and industrial concerns, as well as the general public. Its executive committees include most of the leaders in Japan's engineering and financial circles who, in a recent announcement, have presented the technical program and outlined the various excursions to be made to a number of imponrtant industrial and engineering establishments as well as to the most attractive places in the Island Empire. In fact, twenty-three excursions and inspection tours are planned.

EXCURSIONS PLANNED

Before opening the Congress, four days will be spent by the delegates and guests in sight seeing and promoting intimacy among those present. Inter-congress excursions include visiting Tokyo and Yokohama for the inspection of the post-earthquake reconstruction work. Post-congress excursions include visits to the Naval Engineering Works, Omiya Engineering Works of the Japanese Government Railways, Tanna Tunnel, Ashio copper mines, Metal Research Institute at the Tohuku Imperial University, Mawashiro hydro-electric power plant, Nagoya industrial factories, Mitsubishi dockyards, Government steel works at Yawata, Miike colliery, and the Kyushu Imperial University.

Subjects for papers to be presented

during the technical program are classified into twenty-three divisions. Among those of particular interest to the metal-working field will be found papers on standardization, strength of materials, railway machinery, machine tools and machine manufacturing, machines for conveyance, ordnance, mechanisms, machine designs, equipment for shipbuilding yards, aeroplanes, dirigibles, aero-engines, propellors, miscellaneous aeronautical equipment, engineering materials, and scientific management. Papers presented at the Congress will be published either in full, or in abstract, in the *Transactions* of the World Engineering Congress. Executive offices for the Congress are situated at the Nihon Kogyo Club Building, Marunouchi, Tokyo, Japan.

Dividend Payments Reflect Metal-Working Activity

Larger profits for 1928 are shown in the report of the American Brake Shoe & Foundry Co., and subsidiaries, for the year ended December 31, which shows a net profit of $3,108,121 as against a net profit in 1927 of $2,794,851.

A net profit of $16,244,429 is shown in the report of the Gillette Safety Razor Co. for 1928. The net profit of 1927 was $14,580,902.

The Standard Screw Co., Hartford, Conn., has declared an extra dividend of $1 on common stock and the regular quarterly dividend of $2 on the common and a regular semi-annual dividend of $3 on the preferred stock. The extra dividend will be paid January 15 to stock of record December 19. The regular dividends were paid January 2 to stock of record December 19.

A quarterly dividend of $1 has been declared on the capital stock of the Dominion Engineering Works, subsidiary of the Dominion Bridge Co., Montreal, Canada, payable April 15, thus placing the stock on a $4 annual dividend basis against a $3 basis previously.

In addition to the regular dividend of $1.25 a share declared on common stock, an extra of $4 a share has also been declared by the Remington Typewriter Co., after paying $1.75 on the first preferred and $2 on the second preferred stock.

The regular 7 per cent dividend on preferred stock with a 6 per cent cash and 20 per cent stock distribution on common were declared at the annual meeting of the stockholders of the Avery Power Machinery Co., Peoria, Ill., maker of harvester equipment.

There will be distributed to the common stockholders of the Niles-Bement-Pond Co., 2⅛ shares of the common stock of the United Aircraft and Transport Corporation for each share of the former's common stock.

The Spicer Manufacturing Co., and subsidiaries, Plainfield, N. J., reports for the year ended December 31, combined profits available for dividends of $2,600,000, equal to $6.20 a share on common stock, after providing for the annual dividend requirement of the new preference stock. For 1927, the company reported its profits as $1,116,352.

The last quarter of 1928 was the most profitable one that the Union Carbide & Carbon Corporation has ever had, and as a result it is probable that the company will show a net profit for last year of more than $27,000,000, or between $10 and $11 a share.

The Billings & Spencer Co., Hartford, Conn., will retire ten-year 7 per cent gold bonds dated March 1, 1925, in the amount of $550,000. The bonds will be redeemed at $105 plus accrued interest as of March 1, 1929.

Labor Shortage, Low Wage Scale, and Low Output Problems France Seeks to Solve

By Our Paris Correspondent

AN APPARENT industrial activity has created a scarcity of unskilled labor and has increased manufacturing costs in consequence. This condition is bringing consumer prices on manufactured goods well up to world (gold) figures. The great problem for the manufacturer in France will soon be how to stimulate the home market and how to compete in foreign markets. American competition in machinery and automobile lines is already demonstrating the strength of this both in France and abroad. A well-known popular French car sells in Switzerland, for instance, for considerably more than a very superior American automobile, each paying the same customs duties. This circumstance needs no comment beyond the recognition of the comparative production methods of France and America.

An active and incessant campaign on the part of the American machinery manufacturer is called for if he is to increase business in France, else the all-round tool, usually at a lower cost if it is imported from Germany, will take the place, if not fill the bill, of the more highly productive American machine. There are no statistics available which indicate the years of service of machine tool equipment of most French plants, but, aside from three or four comparative high-production automobile plants, it is known that many such are working with equipment which has long been ready for scrapping.

Increased markets for an increased output of machined products, if such be possible, will ultimately make further demands for even ultra-modern machinery, otherwise the metal-transforming industries will continue their conservative pace and muddle along. The whole problem is there. Some in France see it; Some do not.

A new note has recently been struck in the metal-working trades by the advantages which semi-finished products from foreign sources offer. The metallurgical industries are already feeling the effects of such imports, and, if French cast-iron pipe is actually being sold in America, it is equally true that American steel sheets entering into automobile production are being sold to French manufacturers.

Contributory proof of French industrial activity is shown, however, by the fact that the railroads have 6,000 more locomotives and 150,000 more freight cars in service today than before the war, to say nothing of a million automobiles, buses and trucks on the road, five times the pre-war number. Freight car loadings in 1928 were a million more than in 1927, but less than in 1926

Railway rolling stock manufacturers are apparently finding some new business, but none are believed to be working to capacity nor are they likely to be buying new machinery. The government naval program is bound to bring some activity to government and private shipyards during the year, one of the latter on the Mediterranean having received an order for a single unit to cost 40,000,000 francs.

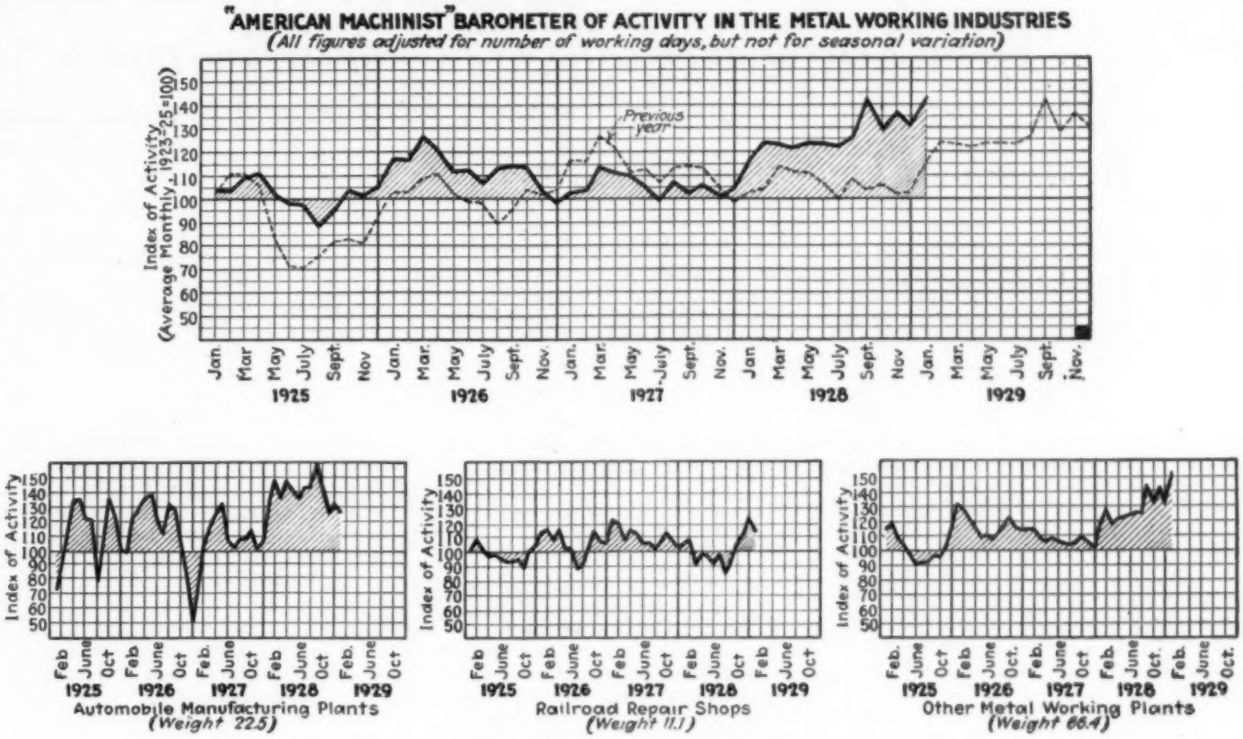
Metal costs, more than any other item, is affecting many small unit productions such as wire, chains, bolts and nuts, as well with respect to incorporated elements in other production, as with building hardware and fittings. Labor is scarce in these industries, and this again suggests the incorporation of high-production machinery in many of these drawing and stamping trades of the east of France where little progress has been made as yet toward eliminating the small high-cost operated plants.

A French firm producing agricultural machinery has taken the radical step of turning out a large part of its product of finer materials than usual, even to the extent of making use of electric steel, on the supposition that the consumer will pay the price for a more durable, superior machine. It has furthermore tackled the subject of standardization in a like vigorous manner and has reduced the variety of bolts and nuts on a reaper and binder 30 per cent.

Foundry orders are facing a possible increase of the equivalent of $1 a ton. This will affect many smaller machinery and tool manufacturers whose plants are not self-contained.

The automoblie industry and the demands of the railroads for equipment specialties and elements are keeping the steel stamping industries reasonably busy, but prices in the majority of cases are considered as too low for profit. A rise is due here.

The national machine tool industry professes to have satisfactory orders in hand, but prices are seemingly headed for a rise, it being considered useless to struggle at a loss against American and



Record Rate of Activity During January

Incomplete reports on the consumption of electrical energy for power purposes strongly indicate that another record was made by the metal-working industry during January. Practically all reports indicate plant operations in excess of those in November and December.

The January rate of operations in the metal-working industry as a whole, after corrections are made for the number of working days, was 7.5 per cent over that of December, 18.6 per cent over January last year, and just slightly above the previous record rate of operations reported for last September. The metal-working industry appears to be enjoying to the fullest the prosperity which is prevalent throughout the nation in all but a few industrial groups.

Automobile plants report a curtailment of operations, but the continued high operations of the Ford plants will probably keep the January index for this industry close to that recorded for December.

German competition at home and abroad.

The Syndicate of Machinery Manufacturers emphasizes the fact that foreign, notably American, competition in the French domestic market is becoming more forceful than ever. It is opposed, however, to any general European free-trade scheme, which others have suggested as being the only way to stop the American invasion. The stand taken is that France might well seek to absorb as much as possible of French manufactures, which is all very well for consumer goods, price and quality being equal, provided that the mass is really able to judge of this, but has not the same merit when it comes to production machinery which is often admitted as having qualities that a national product has not.

Regardless of the readjustments which France is going through, the country has outgrown its pre-war condition of being a country of merely average production and has become, in certain lines at least, a country of concentrated production on more or less modern lines. Automobile production alone is four times what it was in the pre-war year.

The government labor bureau records less than a thousand unemployed in major industries. Foreign labor has been leaving the country in numbers in excess of those entering. The metal trades of the Paris district are having difficulty in recruiting skilled labor and the heavy metallurgical industries are suffering from a similar shortage of heavy labor. Almost without exception the metal industries throughout the country report similar conditions.

A new professional group has been founded to bring together manufacturers of paper making machinery, an industry which has greatly increased in France of recent years. Imports have hitherto been largely from Germany.

There is a tendency in the heavy industries toward organizing selling groups or cartels. How far this will be carried either on national or international lines is not yet to be foreseen, but American trade experts in France have already noted the signs of the times. One automobile group also has made a concerted effort in the same direction and with some measure of success. The limits to which such effort may be carried are still far away and it may be that in the reduction of selling costs, French manufacturers in many lines will be able to reduce the consumer price.

Metal workers' associations and groups are continually criticising the disproportionate relation between wages and living costs. Wages in the Paris district are 7 per cent short of meeting the increase in living costs of necessaries of the last year, according to the *Revue Syndical de Documentation*. It is pointed out that the wholesale costs of minerals and metals show an index rise since the end of October of 13 points (now 609), while the general index of manufactured "national" articles in the same period indicate a rise of 7 points, which is apparently not being passed on to labor.

The application of scientific management and normalization in the machinery industries is making headway, if but slowly. The Union of Metallurgical and Machinery Industries has a collection of 1,400 files and 166 volumes available for reference of its adherents, and a monthly bulletin is issued besides an informative booklet which has been distributed in an edition of 10,000 copies. Visits are continually being made to various modernly equipped plants. All this, in the long run, is going to help out in the labor situation as also it is going to give impetus to the demand for modern conveying appliances and high-production machinery and tools

BUSINESS BAROMETER .... *Apparently the Federal Reserve authorities mean business, and their warning against the use of reserve credit for stock speculation foreshadows higher money rates*

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

BONDS of the United States government, which are the premier investment security of the world, declined last week to the lowest prices in nearly five years, and Fourth Liberty 4¼'s sold at 99¾ to yield more than 4¼ per cent. This fainting spell, which has affected all high-grade bonds, probably indicates that the financial world, after another week to consider the matter, has decided that the Federal Reserve authorities mean business, and that their warning against the use of Reserve credit to finance speculation foreshadows a period of continued high and probably higher money rates.

To such a condition enthusiastic speculators might be immune if they could be confident that enthusiasm would hold out, and that they could therefore sell stocks to each other at constantly higher prices and make profits in comparison with which the cost of the credit employed would be insignificant.

But the Reserve Board's attitude is chilling to enthusiasm. If it causes a break in the circle around which stocks are being passed, an attempt will be made to hand them around in the reverse direction, and the result must be a greater collapse in prices than has yet occurred.

If, on the other hand, the attempt to check speculation by giving warning is ineffective, it is virtually certain that money rates will go higher; and dearer money will eventually cause a recession in business.

In either event the future of the "new era" seems more dubious than it has been at any time in the past few years, and the only new agency that can lift it from between the horns of the dilemma will be gold imports so large that the Reserve Banks cannot "sterilize" them by selling equivalent amounts of their bill and security holdings. As to whether we shall receive such imports one guess is probably as good as another, but everyone will agree that the advance in the Bank of England rate has greatly diminished the probability.

Meanwhile efforts to whip up the stock market again have mostly failed, and prices are little if any above the levels to which they dropped after the Board's statement was issued. A straw that shows the direction of the wind is another advance in acceptance rates to 5¼ per cent on 60- and 90-day paper, which is a quarter higher than the New York Reserve Bank's rediscount rate. This is an anomaly, which in this country has seldom existed, and it is but one of many reasons why the eyes of the financial community are centered nervously upon the Reserve Bank's policies.

SALES of machine tools and machinery are being maintained at an excellent level in many of the leading industrial centers of the country, with the South, perhaps, as the only district where business activity is below that of the same period last year. In view of the slow but steady improvement in sales there in the last three weeks, however, it is very likely that this condition will be changed before long. Indianapolis, while it reports no outstanding business, finds dealers well satisfied with the present volume of sales, with the radio equipment manufacturing industry as the leading buyer, and the automobile body builders next.

DETROIT, on the other hand, reports a decided spurt in the last ten days. Present activity is far ahead of that in February, 1928, with both the body and the engine shops buying on a large scale. Cincinnati reports business excellent, both in the local market, as well as regards orders received by the tool builders from outside sources. New York is extremely active, and in New England to the uninterrupted demand for single tools come a few sizeable orders.

FOR the first time in some years, inquiries from railroads are reported by the Cincinnati builders to be in good volume. Railroad inquiry is the principal feature of the Chicago market. In the South, also, the roads are beginning to show more interest.

IN CANADA, the demand for production equipment is steadily increasing and January business was well in excess of that placed a year ago. The car and locomotive building shops are the most active.

Therefore the weekly statement of the condition of the twelve Banks issued last Thursday deserves more than the usual attention. It reveals the sale of $23,000,000 in government securities and a decrease of nearly $20,000,000 in acceptance holdings. But this decline of $43,000,000 in the volume of Reserve credit in use was offset by an increase of $52,000,000 in loans to member banks, and there was also a gain of $23,000,000 in gold. Thus no progress was made toward reducing the amount of credit, although by selling securities and allowing bill holdings to decline, the Reserve Banks are carrying out successfully the first steps of a restriction policy. The logical second step will be to check rediscounting either by increasing its cost or by a direct refusal to accept paper, when the bank offering it is lending in the stock market.

Whether this second step will be taken is now the subject of intensive debate both within the system and in the halls of Congress, and every scrap of news that bears on the question is being eagerly scanned. About all that has developed thus far is a general fear that the Banks will be unable to carry their assault on speculation to an effective end without also involving business in its downfall.

So much space is given to this discussion because nearly everyone recognizes the great bearing that the Reserve policies of the next few weeks and their outcome will have upon business for the second half-year. But until it can be said more certainly what those policies will be, and whether they will be aided or opposed by such important factors as the gold movement, a decision must be held in abeyance.

The business record of the present is one of the most inspiring that has ever been spread before American eyes. The iron and steel and automobile industries are operating at the highest rate they have ever reached at this time of year, if not for all time, and it seems certain that their great activity will be maintained during March at least. Most of the building reports indicate that there is a decline as compared with a year ago, because the industry is being pinched between slightly higher material prices and wages and the higher price of the capital.

Distributive trade continues highly satisfactory and car loadings are still larger than a year ago. The commodity markets with a few exceptions are firm and, in some an increased speculative interest is evident. Rubber consumption made a new high record in January.

These are the high lights of a business situation whose potentialities are extraordinarily varied and may last for some time.

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The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

INDIANAPOLIS

While there appears to be no particularly active business in either the machinery or the machine tool trade, Indianapolis dealers express themselves as being well satisfied, when the season of the year is considered. Business is somewhat spotty, one of the bright spots being the radio business.

In this industry, new concerns are springing up all the time in this area and equipment orders are increasing in volume. Those factories that have been in business for some time are increasing their output and the new ones have to be equipped. Small tools particularly seem in demand.

Another bright spot is the automobile body business. Factories in this line have worked almost steadily since a year ago, and there seems to be no sign in view that would indicate any cessation in business. Most of the demand seems to be for special woodworking machinery, but there is some call for stamping machines and other metal-working machinery.

The automobile demand up to the present time is not so good. Some machinery and some tools are being purchased, but spring business has not opened up, and many local dealers believe it will be a couple of weeks yet before the factories here begin to prepare for spring business to any marked degree. Some inquiries are being received, however. Outside of Indianapolis, particularly in South Bend, business is reported good.

Only a fair amount of railroad equipment is being purchased, weather conditions having made it imperative for the roads to keep all the motive equipment possible in operation.

CANADA

Demand for machinery and machine tools in Canada is steadily increasing. The volume of business transacted in January is reported to have been considerably in excess of the same month last year, and the outlook for first and second quarter business is highly promising. The steel industry is preparing for a revival of interest; locomotive plants are working at full capacity, and the automotive industry is well employed.

The Steel Co. of Canada has launched out on a $7,000,000 extension program, and the National Steel Car Corporation is spending $1,750,000 in improvements to plant and equipment. The Algoma Steel Corporation will shortly begin its program of expansion in several directions, including the enlargement of the rail mill and merchant mill. The Dominion Bridge Co. has just received an order from the International Nickel Co., for 23,500 tons of steel for extensions projected at Coppercliffe, Ont. The Dominion Foundries and Steel Co. has had an unexpected revival and the plate mill, built in war time, is in operation for the first time in many years. More than 500 men are now employed.

The Canadian Locomotive Co. plant at Kingston is working at full capacity with assurance of full-time operation for some time to come. The mining machinery department is very busy. The absorption of Charles Walmsley and Co. of Canada, by Dominion Engineering Works, Ltd., brings to the purchasers a considerable volume of business on hand. At the present time the Walmsley company is constructing a number of large newsprint machines.

General Motors of Canada announce that they will build 40,000 trucks and coaches in their Walkerville plant this year. Employment there has reached 2,000 already, and will probably increase to 2,500 this year. Officials of the Cockshutt Plow Co. Ltd., announce that January shipments amounted to 308,000 as against 156,000 in January of last year.

The Precision Machine and Foundry, Limited, of Calgary, Alberta, has launched an expansion program involving the expenditure of $120,000, and including the erection of a foundry and extension of present works. Construction of automotive parts, tractor parts, and specialization in scientific casting are features of new activities of the firm, formerly the Precision Machine Company.

SOUTHERN DISTRICT

There has been a slow but steady improvement in machinery and machine tool sales by Atlanta dealers during the past two or three weeks, but business in general seems to be somewhat weaker than it was at this time last year, although inquiries are being received and reports are satisfactory from salesmen in the field.

The mills are getting lower prices for lumber and the low prices prevailing generally for nearly all woodworking products, with the exception of furniture, are having an adverse effect on demand for woodworking machinery, though a few scattered sales are reported in different parts of the Southeast. Sales to the furniture industry are fair, especially in the Georgia and North Carolina territory.

Machine shop demand is not overly good, except that some orders are being placed by larger shops for used or rebuilt equipment, and, in spite of the fact that 1928 was an unusually good automobile year in this section, about the same condition holds true in the garage and service station field.

In the textile field new mill work is in progress in all of the states of the Southeast at this time, and not only are a number of sizable orders for mill and shop equipment being received, but inquiries are heavy also. The outlook is the best in some years.

Railroads are showing greater interest, and are placing a few orders for heavy shop equipment, with the outlook of a prosperous year in that field. Sales of road building and contractors' equipment are also quickening, with a better than normal season in prospect.

NEW ENGLAND

Inquiry for a wide variety of machine tools holds strong, with orders evenly distributed. Automobile interests in the Middle West are forward buyers in the New England section. Although the uninterrupted demand for single tools has been augmented with more orders calling for several units, the percentage of placements for single tools remains remarkably high.

Woodworking machinery has been a more prominent factor in this market, with new promise from sources in and about Boston.

A southern Connecticut valve manufacturer with expansion in progress anticipates a list of mechanical equipment shortly, the nature of which is not known. An executive representative of an Eastern company considering manufacturing in the aeronautical field has been active in this section, with a view to purchasing mechnical equipment. From all present indications February will average comparably with January.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that business was at an excellent level during the past week. In some cases an increased volume of sales was reported, but the great majority stated that the variation from the previous week was so small as to be negligible.

Selling agents report that they booked a good volume of business in the past week. Plenty of prospects are being developed in local and adjacent territory, it is stated, and an increased percentage of the inquiries on hand are developing into purchases.

By far the greater portion of the week's business was made up of sales of single tools and replacements, but here and there was an order of larger size. The great majority of the buyers were general machinists, and the orders were well diversified as to sizes and types of requirements.

Manufacturers report that a good volume of inquiries were received in the week, these coming from all sections of the country. According to one manufacturer, railroads are making a considerable number of inquiries from selling agents in another territory, which fact he regards as an indication that this field is about to open up.

CHICAGO

Business in machine tools is holding up to the satisfaction of the trade. While sales during the last week showed a slight decline from those of the preceding one, the total volume averaged well. Railroad inquiry was the principal feature of the market, the Chicago, Milwaukee & St. Paul and the Chicago Rock Island & Pacific being the roads most particularly interested, with the Atchison, Topeka & Santa Fe coming next.

Outside of the railroads, general demand is from diverse directions, though still largely in the Chicago industrial area. Inquiry is for standard tools of various types, large and small, employed in industrial plants and machine shops; screw machines, punch presses and drill presses being in particular demand. Business in used tools is holding up well, and prices for this class of equipment are being well maintained.

The prevailing feeling among machinery manufacturers' representatives and distributors with respect to prospective business for the first quarter of the year has not undergone any change, the belief still being that it will come up to the forecasts. As the year advances, railroad buying will increase in volume, according to most opinions expressed.

DETROIT

With many large and small orders for equipment having already been received, and with many more immediately in prospect, the machinery and machine tool trade in Detroit and the Michigan district has taken a decided spurt within the past ten days. Business was good in January, and was fair in the early part of this month, but there was a feeling that things had not really gotten started. Early February business, many dealers reported, was slower than January, but this was considered to

be due to the automobile shows, which usually have a tendency to slow things up.

Within the past few days, so many orders for machinery and tools of all kinds have been received that there is a predominant note of optimism throughout the trade here. One firm has received a large number of orders for drilling machines from one of the largest automobile manufacturers. This dealer reports that the manufacturer has become interested in diamond boring for all jobs and that there are indications of large scale changes in equipment because of this.

Generally speaking, the automobile manufacturers are all in the market for equipment, a large amount of it being for replacement and much for expansion. There have been many orders for equipment from the body manufacturers, many of whom are making large additions to their die facilities. Among the outstanding buyers in this field are Fisher and Packard, although there are a number of others. The new Cadillac machine shop has resulted in some buying, as has the Chrysler expansion, the Chevrolet, Pontiac and Oakland developments, and others, including Hupmobile, Buick, Durant, Overland and Graham-Paige. The Marble Carburetor Company is putting up a new building, Continental Motors is making extensions to its aircraft department, Frost Gear & Forge at Jackson has bought a large amount of machinery, and innumerable other concerns have made smaller purchases.

There is every prospect here that this will be a record-breaking year in the automobile business, and that means of course that it will be a record-breaking year in the machinery and machine tool trade. Already February is far ahead of February, 1928, which was a very good month. The aircraft business is beginning to be a small factor in the machinery trade, and there are many indications that it will be larger before the year is out. Employment continues to advance and general conditions are good.

NEW YORK

Sales of machine tools in the New York market continue at a high level, and it appears that February volume will be the highest in the history of many of the local dealers. In some cases the number of machines being sold in a week equals what was considered a normal month's business a year or less ago. Few large sales are reported, although the sales of large, expensive machines are making up for what might be lacking in large volume of smaller machines. For example, a number of tools in the $10,000 class were sold during the past week.

On the other hand, there are several large sales pending running well up to $50,000, and the volume of single unit sales continue unabated. Perhaps the largest number of inquiries received in some time came from the General Electric Co. Over seventy machines were called for. Another prospective buyer of some account is the New York Central R.R. which is giving manufacturers of railroad shop equipment some hope of a better market in this territory this year than last. Little activity on the part of other roads is noted, however.

Sales made by the Triplex Machine Tool Co. during the past week included: Two Ames bench lathes, two Ames bench millers, one 24-in. Springfield lathe, two hand millers and three bench drill presses.

Expansion Programs Numerous

Production of the H. H. Franklin Manufacturing Co. is 70 cars daily or 300 per cent above that of a year ago, although the working force is only 40 per cent larger. Sales for January were 81 per cent above those of a year ago, and the February orders indicate sales 90 per cent greater than those of the same month last year.

When completed next spring, the expansion program of the Steel Car Corporation of Hamilton, Ontario, will have doubled the capacity of the plant. This calls for an expenditure of $1,750,000.

Production of 275 machines a day is not sufficient to meet the current demand on the Automatic Washer Co., Newton, Iowa. The output will soon be up to 300 with new machinery to be installed for further production capacity.

Unfilled orders amounting to $300,000 are on the books of the Perkins Machine & Gear Co., West Springfield, Mass., which will install additional machinery to meet its sales demands, it was stated at the annual meeting Feb. 13, when all the officers and directors were re-elected. JULIAN L. PERKINS is president and ADOLPH W. GILBERT chairman of the board.

The Stanley Insulating Co., Great Barrington, Mass., is considering doubling its output. New machinery is contemplated, including welding equipment. A new one-gallon ice cream container will shortly be placed on the market.

Announcement has been made of the removal of the general offices of the L. C. Smith Typewriter Co. from its plant in Syracuse to New York in order to make room for additional manufacturing facilities.

Unfilled orders on hand that will require three months to clear away has necessitated a 24-hour schedule at the plant of the Mossberg Pressed Steel Corporation, Attleboro, Mass. A substantial increase in the size of the plant is contemplated. This concern specializes in the manufacture of pressed steel equipment for the wire industry.

The Murray Corporation of America will start construction at Memphis of a $2,000,000 plant for production of wooden parts for automobile bodies.

The Pittsburgh Screw & Bolt Co. has acquired the Graham Bolt & Nut Co. in which the Jones & Laughlin Steel Co. had a substantial interest. By also owning the Gary Screw & Bolt Co., the Pittsburgh Screws & Bolt Co. ranks as one of the largest producers of bolts and nuts in the country.

Construction has been started on a large plant costing $200,000 by the East St. Louis Castings Co., St. Louis, Mo., for the manufacture of a new type of warm-air, smoke-consuming furnace.

The Newton Steel Co. of Newton Falls, Ohio, is now completing arrangements for its new plant at Monroe, Mich. This company, which furnishes sheet steel to the automotive industry, is planning to start construction work on the first unit of its $30,000,000 development before April 1.

The new plant of Chrysler Motors for the manufacture of the new Plymouth car has been opened in Detroit.

Coincident with increase of its $50,000 capital stock to $200,000, the Rosco Huller Co., Fort Dodge, Iowa, has announced purchase of a factory site near by, and plans for expansion of its factory and sales distribution organization. The plant is now turning out from 10 to 15 machines a week and this production will be constantly increased. Changes in executive personnel of the company have resulted in the following officers: S. N. Tremper, president; J. R. Mulroney and Frank A. Heldredge, vice-presidents; Leonard P. Heldredge, secretary and production manager; and Frank S. Battin, treasurer and sales manager.

Business Items

The Curtiss-Caproni Corporation, formed to build the Italian Caproni seaplanes in the United States, recently offered 200,000 shares of common stock to the public at $12.50 per share. There will be presently outstanding 400,000 shares. The corporation will receive the technical supervision of the Curtiss Aeroplane & Motor Co., Inc., and also of Gianni Caproni, the inventor.

The largest single order in the history of the aeronautical industry was placed on February 5, when a contract for 350 airplane motors was placed by the Fokker Aircraft Corporation of America, at Los Angeles, Calif. The contract, which amounted to $2,400,000, was divided between the Wright Aeronautical Corporation and the Pratt & Whitney Aircraft Co., and calls for the delivery this year of 200 motors of 425 hp. and 150 motors of 525 hp. Harris M. Hanshue, president of the Fokker company, said the motors would be placed in planes for export trade and in multi-motored aircraft for mail, express and passenger service.

The Arrow Aircraft and Motors Corporation, Lincoln, Neb., has been formed to produce the Arrow Sport biplane, a two-place machine, weighing only 757 lb. empty. The fuselage is made of steel tubing. Marks W. Woods is president of the company.

Articles of incorporation have been filed by the Noble Machine Co., Fort Wayne, Ind. The corporation has an initial capital stock of 850 shares of no-par value and is formed "to manufacture, sell, buy, repair, equip, lease, alter and maintain new and used machinery." The incorporators are William Noble, W. Kenneth Noble and Morris H. Waltemath.

Common stock of the Standard Oil Co. of N. J., to the value of approximately $865,000, was distributed among the 875 employees of the Gilbert & Barker Manufacturing Co., West Springfield, Mass., a subsidiary of the Standard, on February 11, under a three-year stock acquisition plan by which the employees have deposited $481,686.50. Each employee is permitted to invest up to 10 per cent of his earnings.

The Frew Machine Co., 124 West Venango St., Philadelphia, Pa., has taken over the line of milling machines formerly made by John Steptoe & Co., of Cincinnati, and is in a position to furnish repair parts for these machines to present users.

Production at the Wood Brothers Threshing Machine plant, Des Moines, Iowa, is now on basis of 15 machines daily with a scheduled output of 25 machines later in the month. When activities shift to the new combine thresher March 1, it is estimated that the present force of 250 men will have been doubled. The factory this winter completed a 300,000-sq.ft. factory addition.

Net sales of the Hart-Parr Co., tractor manufacturer, for the first quarter of the fiscal year begun Nov. 1, 1928, will exceed $2,000,000, against $879,000 in the corresponding period of the preceding year. January production is expected to exceed 1,200 tractors, which will bring first-quarter totals to more than 2,200 machines.

The Hart & Hutchinson Co., New Britain, Conn., has increased its capital stock from $300,000 to $1,000,000. The company has recently been experimenting on new-designed heating radiators for residences. Its principal product is steel lockers.

The Detroit office of the Seneca Falls (N. Y.) Machine Co. has been moved from 236 Richton Ave. to 10-217 General Motors Bldg. The office is in charge of W. H. Nettle, Midwest representative covering Michigan, Ohio, and Indiana.

The plant of Northern Blower Co., Cleveland, Ohio, is now being extended by the addition of manufacturing floor-space of 75x125 ft. The old building which formerly occupied the space has been torn down, and the building which is replacing it will be of the most modern construction.

The Underwood-Elliott-Fisher Co., Hartford, Conn., on Feb. 11, increased its working schedule to 57 hours a week. The company is enjoying increased business and a rush of orders. The 4,200 workers in the plant are on the new schedule.

The net profit of the Link-Belt Co., Inc., and subsidiaries, for the year ended December 31, 1928, was $3,241,823 as against $2,457,436 in 1927.

Common stockholders of the Studebaker Corporation, South Bend, Ind., receive a 1 per cent quarterly stock dividend in addition to cash dividends under a new policy adopted by the board.

Personals

CHARLES E. VAN NORMAN has been elected treasurer of the Van Norman Machine Tool Co., Springfield, Mass., to fill the vacancy caused by the death of Frank H. Page. Mr. Van Norman continues to fill the office of president also. Kenneth H. Page, Henry A. Field and George W. Kyberg have been elected directors.

E. E. BOON, formerly with the Westinghouse Electric & Manufacturing Co., has been appointed sales manager of the Westinghouse-Nuttall Co., succeeding J. E. Mullen. Mr. Mullen now is with the National Foundry Co., Erie, Pa.

C. M. TAYLOR, vice-president and factory manager of the Lincoln Electric Co., Cleveland, has been appointed sales manager of the company. He has been with the Lincoln company since his graduation from Western Reserve University in 1916, except for two years during the War when he was an aviator in the U. S. Army Air Corps. He returned to the company as time study de-

monstrator and observer. In 1923, Mr. Taylor was made factory manager and in 1925 was made vice-president. He remained as factory manager until his present appointment.

J. E. JOHNSON, chairman of the board of directors of the Waterloo (Iowa) Savings bank, has been engaged as advisor and is in charge of the Litchfield Manufacturing Co. plant, Waterloo, conducting a survey upon possibility of continuing the operation of the manure spreader and steel farm truck plant, as a separate unit. The Commercial National company, receiver of the plant, has taken over the industry. Mr. Johnson was formerly secretary and manager of the Waterloo Gasoline Engine Co., now the John Deere Tractor Co. and is widely known in the implement field.

ROBERT W. GILLISPIE, vice-president and general manager of the Jeffrey Manufacturing Co., Columbus, Ohio, has been elected president and general manager of the Galion Iron Works & Manufacturing Co., of Galion, Ohio, recently acquired by the Jeffrey company. D. C. Boyd was named chairman of the board; J. S. Boyd, vice-president, and F. W. Faber, secretary and treasurer.

WILSON P. HUNT was re-elected president of the Moline (Ill.) Tool Co. at the annual meeting last week, but was relieved of managerial duties in connection with administration of the company's affairs to give him greater opportunity for research and development work.

Obituaries

MATTHEW GRISWOLD, who retired on Jan. 1 as manager of the Erie Works of the General Electric Co., died at his home in Erie on Feb. 10. He had been born in that city in 1866. Upon his graduation from the Sheffield Scientific School, Yale University, in 1890 he became associated with the Griswold Manufacturing Co., of which he served as president for many years. In 1911, he severed his connections with the Griswold concern to become acting manager of the Erie Works of the General Electric Co., of which he became manager the following year.

EDWARD G. MEINCKE, machine shop foreman of the Joshua Hendy Iron Works, Sunnyvale, Calif., died on Jan. 27 at the age of 56. For 36 years "Ed," as he was familiarly known, was with the Hendy works, having been apprenticed there. He has been foreman for the past ten years.

WILLIAM SHERMAN BUMBAUGH, 62, founder and president of the Monessen (Pa.) Foundry and Machine Co., died on Feb. 8 at his home in Belle Vernon, Pa. He was prominent in local industrial and banking circles, as well as in fraternal organizations.

BENJAMIN L. SOMMER, one of the most widely known and recognized authorities in the steel industry in the Middle West, chairman of the board of directors of the Keystone Steel and Wire Co. of Peoria, Ill., died Feb. 8 in his winter home in Coral Gables, Fla., at the age of 49. He succumbed to heart disease from which he had suffered several years. In addition to his position in the Keystone firm, he was president of the Mid-State Steel and Wire Co. of Crawfordsville, Ind.

W. W. WAINWRIGHT, 74 years old, Connersville, Ind., founder of the Wainwright Engineering Corporation, which later was merged with the McQuay Norris Company, died recently after a long illness. Mr. Wainwright retired from active business some time ago.

Forthcoming Meetings

AMERICAN MANAGEMENT ASSOCIATION. Production Executives Conference, Feb. 27 and 28, March 1, at the Webster Hall Hotel, Pittsburgh, Pa. Annual Spring Convention, May 7-9, in in New York City. W. J. Donald, managing director, 20 Vesey St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

PRICE changes of the week were upward, without exception, in shop materials and supplies listed in the accompanying table. The advances in question occurred in copper, tin, lead, fabricated brass and copper, and scrap non-ferrous metals except zinc. The market for iron continues dull with fuel prices unchanged. Finished steel prices tend upward in hot-rolled strips and blue-annealed sheets. Iron and steel scrap prices remain steady. Forms of finished steel for which there is greatest demand at present are automotive, railway and agricultural implement material and tin plate. Steel mill operations are at about 87 per cent of capacity as against 86 per cent, a year ago.

(All prices as of Feb. 15, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50@17.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.35	3.25	3.90*
No. 12	2.15	3.40	3.30	3.95*
No. 14	2.25	3.45	3.35	4.00*
No. 16	2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.65	3.60	3.40	3.80
No. 22	2.80	3.75	3.55	3.95
No. 24	2.85	3.80	3.60	4.00
No. 26	2.95	3.90	3.70	4.10
No. 28	3.10	4.50	3.85	4.25
Galvanized				
No. 10	2.80	3.95	3.75	4.05
Nos. 12 to 14	2.90	4.05	3.85	4.15
No. 16	3.00	4.15	3.95	4.25
No. 18	3.15	4.30	4.10	4.40
No. 20	3.30	4.45	4.30	4.55
No. 22	3.35	4.50	4.35	4.60
No. 24	3.60	4.65	4.45	4.75
No. 16	3.75	4.90	4.70	5.00
No. 28	4.00	5.15	4.95	5.25

*Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Glav.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

— Thickness — B.w.g. and Decimal Fractions		Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †250 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			18.00
Tin, Straits, pigs, New York			53.50
Lead, pigs, E. St. Louis	6.75	New York	8.00
Zinc, slabs, E. St. Louis	6.35	New York	8.00

	New York	Cleveland	Chicago
Antimony, slabs	13.00	12.62½	14.25
Copper sheets, base	27.37½	27.37½	27.37½
Copper wire, base	23.37½	23.62½	19.87½*
Copper bars, base	25.87½	25.87½	26.37½
Copper tubing, base	28.37½	28.37½	28.37½
Brass sheets, high, base	22.50	22.50	22.50
Brass tubing, high, base	27.37½	27.37½	27.37½
Brass rods, high, base	20.25	20.25	20.25
Brass wire, high, base	23.00	23.00	23.00

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	10.00@10.50	11.00	10.11
Solder (½ and ½).....	34.50	34.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			67.00
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.25

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold rolled.....	53.00	40.00†
Tubing.....	75.00*	90.00
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	15.75 @16.00	14.25	14.75 @15.25
Copper, heavy, and wire..	14.87½@15.87½	13.75	14.12½@14.50
Copper, light, and bottoms	13.37½@13.87½	11.50	12.75 @13.25
Heavy lead.....	5.37½@ 5.62½	6.25	5.00 @ 5.50
Tea lead.....	3.75 @ 4.25	4.25	4.00 @ 4.50
Brass, heavy, yellow.....	9.00 @ 9.50	9.00	9.25 @ 9.75
Brass, heavy, red.....	11.75 @12.25	11.75	12.00 @12.50
Brass, light.....	7.50 @ 8.00	7.25	8.25 @ 8.75
No. 1 yellow rod turnings.	10.00 @10.50	9.50	9.75 @10.25
Zinc.....	3.25 @ 3.75	3.25	3.00 @ 3.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†.....	.16@.16½	38.00 per M	.16
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.108	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.30	.36	.35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales or less.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0324
Cold drawn shafting...	per lb..	.035	.034	.033
Brass rods.....	per lb..	.2025	.19	.165
Solder (½ and ½).....	per lb..	.345	.35	.3425
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.59	3.59	3.10
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.30	.30	.27
Belting, leather, medium.....	off list..	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.05	$4.29	$4.29
Emery cloth.....	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.04	2.04	2.04
Cloth.....	3.59	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.75@2.85
Coke, prompt foundry, per net ton...	Connellsville,		3.75@4.50
White lead, dry or in oil...	100 lb. kegs....	New York,	13.25
Red lead, dry.....	100 lb. kegs....	New York,	13.25
Red lead, in oil.....	100 lb. kegs....	New York,	14.75

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7–16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

Machine Requirements and Industrial Construction

Equipment Wanted

Conn., Bridgeport—Down Town Garage, 281 Fairfield Ave.—garage equipment including drill lathe, small hand tools, and other modern vehicle handling equipment.

Conn., Hartford—State Highway Commission, 12 Washington St.—will receive bids until Feb. 25 for road building tools and equipment.

Mass., Boston—G. G. McLaughlin Co., Room 207, Federal St.—band saw and saw table.

Mass., Boston—R. S. Whittles, c/o Y. M. C. A., Huntington Ave.—automatic screw machines, Hendley lathes and Universal milling machines.

Mich., Detroit—Packard Motor Car Co., East Grand Blvd.—general assembly equipment and conveyor system for proposed 2 and 3 story, 65 x 125 and 63 x 185 ft. aircraft factory.

Mo., St. Louis — Missouri Pacific R.R., Missouri Pacific Bldg., W. A. Hopkins, Purch. Agt.—42 in. band rip saw and resawing machine, four-sided molding machine and swing cut-off saw.

Tex., College Station—A. & M. College, c/o B. D. Marburger, Pres.—is receiving bids for a double drum friction hoist to lift 3,000 lb. at a speed of 180 ft. per minute, with electric driven, 2,300 v., 3 ph., 60 cycle G. E. motor.

Tex., San Antonio—G. Meader, Inc., 300 Broadway—machinery and equipment for general repairing for proposed 2 story, 110 x 150 ft. garage at Main and Poplar Sts. Estimated cost $110,000.

Ont., Fergus — Beatty Bros. Ltd., W. Beatty, Mgr.—equipment for the manufacture of washing machines, pumps and specialties for proposed 1 story, 96 x 336, 72 x 96 and 48 x 150 ft. factory additions. Estimated cost $100,000.

Ont., St. Thomas—St. Thomas Metal Signs Ltd., F. W. Sutherland, Mgr.—equipment for the manufacture of metal signs for proposed 2 story, 65 x 120 ft. addition to factory Estimated cost $45,000.

Ont., Welland—Page Hersey Tubes Ltd., A. M. Mosley, Mgr.—machinery and equipment for the manufacture of pipe for proposed 80 x 525 ft. addition to factory. Estimated cost $150,000.

N. Z., Wellington — General Manager, Railway Head Office — will receive bids until May 8 for bar copper machine, two gate or guelentine shearing machines, drop forging hammer, four punching and shearing machines, three punching, shearing and cropping machines, single ended punching machine, tinsmiths tools, etc.

Opportunities for Future Business

Ala., Bessemer — Pullman Car & Mfg. Co., 79 East Adams St., Chicago, Ill., awarded contract for the construction of a 200 x 1,500 and 150 x 1,200 ft. car building plant here. Estimated cost $3,000,000. Noted Jan. 31.

Calif., Fresno—Bingham-Wenks Planing Mill, 1842 Clay St., had plans prepared for a 1 story, 80 x 115 ft. planing mill at Tyler and Santa Fe Aves. Estimated cost $750,000. Private plans.

Calif., Los Angeles—Bd. of Education, is receiving bids for the construction of a junior high school including shop building, etc. Estimated cost $350,000.

Calif., Los Angeles — Samson Tire & Rubber Corp., 733 East 8th St., awarded contract for the construction of a 265 x 1,350 ft. factory including machine shop, garage, etc. Noted Jan. 24.

Calif., Oakland—City plans to remodel yard buildings for machine, paint and carpenter shops, warehouse, etc., at 4th and 5th Aves.

Calif., Stockton—Fraser Gas Furnace Co., 445 South San Joaquin St., is having plans prepared for a 1 story factory on Fremont St. Estimated cost $50,000. R. P. Morrell, Mail Bldg., Archt.

Conn., Bridgeport—Consolidated Ashcroft Valve Co. Inc., 11 Elias St., awarded contract for a 1 story, 45 x 260 ft. plant on Kossuth St. Estimated cost $55,000. Fletcher Thompson Inc., 542 Fairfield Ave., Archt.

Conn., Milford—Wright & Corson Co., 71 Charlotte St., Bridgeport, manufacturers of rivets, is having plans prepared for a 1 story, 25 x 112 and 155 x 250 ft. factory at Milford turnpike. Estimated cost $150,000. Fletcher Thompson Inc., 542 Fairfield Ave., Bridgeport, Archt.

Ill., Chicago—Grigsby-Grunow Co., 2038 North Kolmar Ave., manufacturers of radio sets and parts, awarded contract for a 1 story, 200 x 250 ft. plant at Dickens Ave., also a 2 story, 150 x 200 ft. plant at 4600 West Armitage Ave.

Ill., Chicago—Schlangen Bros. Co., 2435 Irving Park Blvd., manufacturers of hardware, miscellaneous brass goods, barrel filling machinery, etc., is having sketches made for the construction of a 3 story factory. Estimated cost $200,000. Architect not selected.

Ill., Chicago—Zenith Mfg. Co., 3620 Iron St., plans the construction of a factory for the manufacture of radios.

Ill., Cicero (br. Chicago)—Chicago Extruded Metals Co., 1642 South 54th Ave., plans addition to plant at 16th St. and 44th Ave.

Ill., East Peoria — Caterpillar Tractor Co., M. M. Baker, Local Mgr., awarded contract for the construction of a 2 story foundry. Estimated cost $1,500,000.

Ind., Anderson—Orin Welsh Aircraft Co. plans the construction of a group of buildings for airplane factory. Estimated cost $100,000.

Ind., Marion—U. S. Radio & Television Co., A. Case, Pres., plans the construction of a group of factory buildings. Estimated cost $150,000.

Me., Lewiston—Wade & Dunton Motors, Inc., 28 Park St., awarded contract for a 1 story, 110 x 115 ft. factory. Estimated cost $100,000.

Md., Baltimore—Hutzler Bros., Howard and Clay Sts., awarded contract for a 4 story, 128 x 308 ft. garage, etc., at Saratoga, State and Mulberry Sts. Noted Jan. 31.

Mass., Allston—Arcarn Spring Co., 229 Brighton Ave., plans addition and alterations to factory. Estimated cost $40,000. Private plans.

Mass., Attleboro—L. G. Balfour Co., 25 County St., manufacturing jewelers, will build a 2 story addition to factory on North Main St. Estimated cost $40,000. O. M. Higgins, Park St., Archt.

Mass., Lynn—North Shore Cutting & Die Co., 266 Broad St., is receiving bids for a 1 story factory, including power house and transformer house on Broad St. B. E. Porter, 73 Tremont St., Boston, Archt.

Mich., Lansing—Olds Motor Works, is having plans prepared for a 2 story, 85 x 315 ft. addition to plant at Walnut and Olds Ave. Estimated cost $170,000. Verner, Wilhelm & Molby, 750 Book Bldg., Detroit, Archts.

Mich., Northville—Detroit House of Correction, E. Dennison, Supt., plans the construction of a 2 story furniture manufacturing factory in connection with prison institute. Estimated cocst $100,000. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Mo., St. Louis—Pokorny & Co., Inc., 1301 Washington Ave., awarded contract for a 5 story, 60 x 105 ft. furniture factory at Washington St. and Euclid Ave. Estimated cost $150,000.

N. J., Perth Amboy—Standard Underground Cable Co., 26 Washington St., is having preliminary plans prepared for a 1 story factory at Old Perth Amboy St. Estimated cost $200,000. Private plans.

N. Y., New York—Three Hundred Fifty Seven East 76th St. Corp., J. Ruth, Pres., plans the construction of a 6 story, 75 x 102 ft. garage. Estimated cost $225,000. G. G. Miller, 1482 Broadway, Archt.

N. Y., New York—A. Zupan, Inc., 250 9th Ave., plans the construction of a garage at 729 West 186th St. Estimated cost $75,000. J. C. Hankinson, 529 West 111th St., Archt.

O., Cleveland—American Coach & Body Co., J. Holan, Pres., 3809 Clark Ave., awarded contract for a 1 story, 60 x 200 ft. addition to factory. Estimated cost $50,000.

O., Cleveland—National Telephone Supply Co., F. P. Auxer, Pres., 5100 Superior Ave., awarded contract for a 2 story addition to factory. Estimated cost $60,000. Noted Jan. 24.

O., Cleveland—White Motor Co., G. H. Kelly, Treas., 842 East 79th St., is having preliminary plans prepared for a 2 and 3 story, auto sales and service building at East 51st St. and St. Clair Ave. Estimated cost $200,000. Hadlow, Hughes, Hick & Contad, Citizens Bldg., Archts.

O., Cleveland—Willard Storage Battery Co., P. H. Voth, Engr. of Construction, East 131st St. and St. Clair Ave., awarded contract for a 2 story, 70 x 160 ft. factory. Estimated cost $60,000.

Okla., Ontario—Eagle-Picher Lead Co., Joplin Mo., is having plans prepared for addition to smelter plant here. Estimated cost $75,000. Private plans.

Okla., Oklahoma City—J. B. Klein Iron & Foundry Co., 1006 West Second St., is having plans prepared for the construction of a new steel plant at 4th and Blackwelder Sts. Estimated cost $175,000.

Pa., Oil City—Manion Steel Barrel Works, Rouseville, plans the construction of a cooperage plant here. Estimated cost $150,000. Private plans.

Pa., Philadelphia—J. J. Nesbitt, State Rd. and Rhawn Sts., will soon award contract for a 1 story, 108 x 142 ft. addition to factory for the manufacture of unit ventilators. Ballinger Co., 12th and Chestnut Sts., Archt.

Pa., Philadelphia — Pennsylvania R.R., Broad St. Station, awarded contract for the construction of a machine shop at Greenwich Point.

Pa., Pittsburgh—Kerotest Mfg. Co., Liberty Ave., will soon award contract for a 2 story, 80 x 100 ft. plant. Estimated cost $100,000. J. T. Steen & Son, Vanderbilt Bldg., Archts. Noted Jan. 31.

Tenn., Memphis—Murray Body Corp., Clay Ave. and Russell St., Detroit, Mich., awarded contract for the construction of a 2 story woodworking plant here. Estimated cost $2,000,000.

Ont., Georgetown—Smith & Stone plans the construction of a 2 story factory for the manufacture of electrical supplies. Estimated cost $50,000. Architect and engineer not selected.

Ont., Port Hope — Matthews Conveyor Co. will soon receive bids for a 1 and 2 story, 40 x 60 and 60 x 80 ft. conveyor plant on John St. Estimated cost $50,000. Private plans.

Ont., St. Thomas — Canadian National Railways, Montreal, Que., and Wabash Ry. Co., Exchange Bldg., St. Louis, Mo., plan the construction of new railway yards and repair shops here. Estimated cost $1,000,000. C. S. Gowski, Ch. Engr. (Canadian National Ry.), and M. F. Longwill, Ch. Engr. (Wabash Ry.).

Ont., Toronto—Rogers Batteryless Radio Co., 90 Chestnut St., awarded contract for a 2 story, 80 x 250 ft. radio factory on Fleet St. Estimated cost $200,000.